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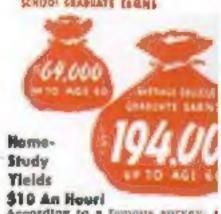
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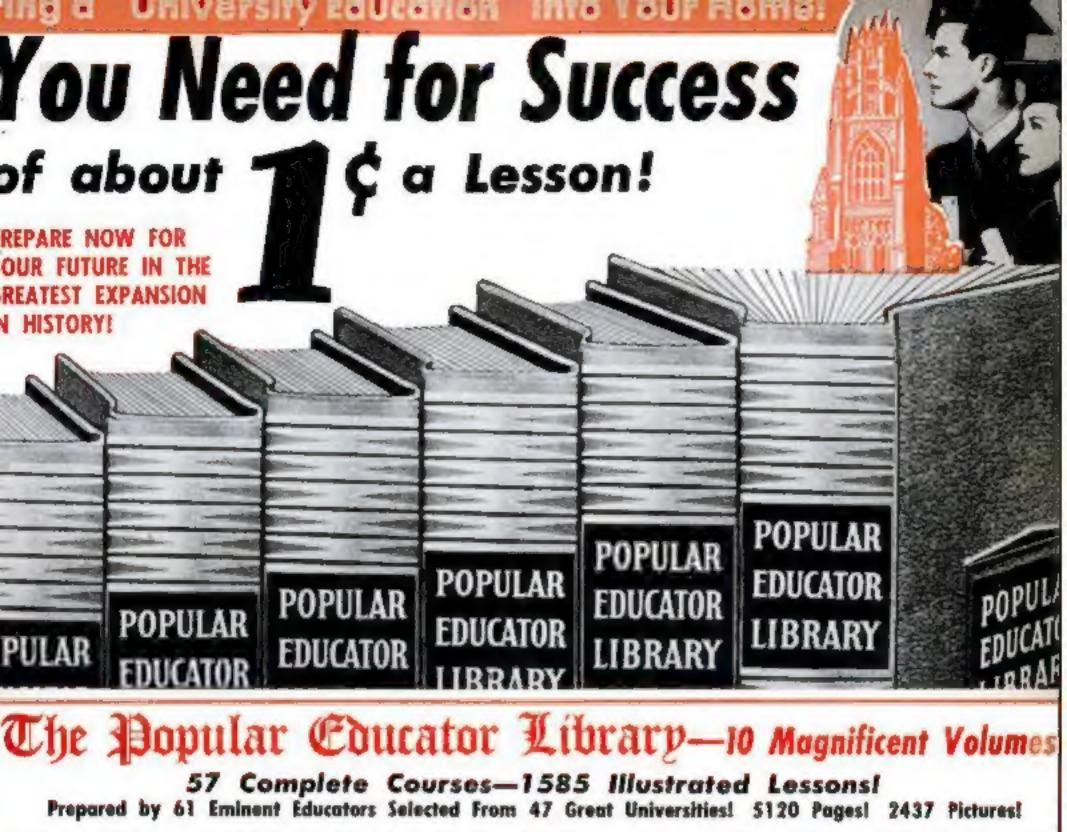
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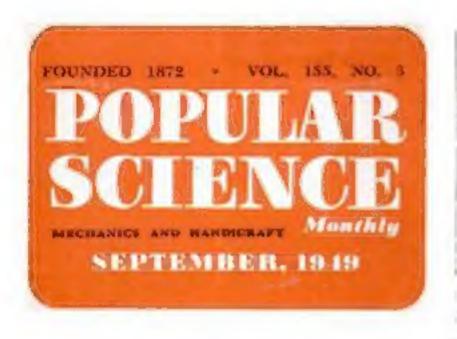
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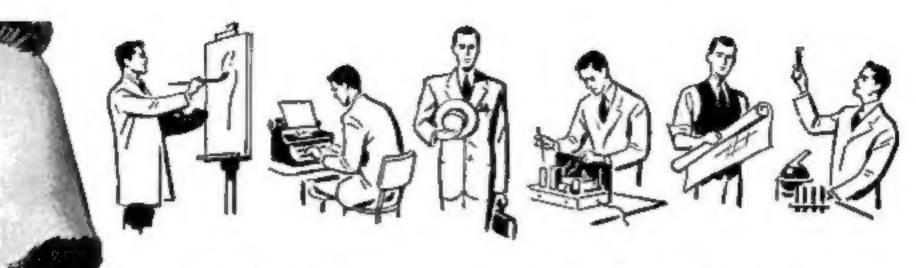
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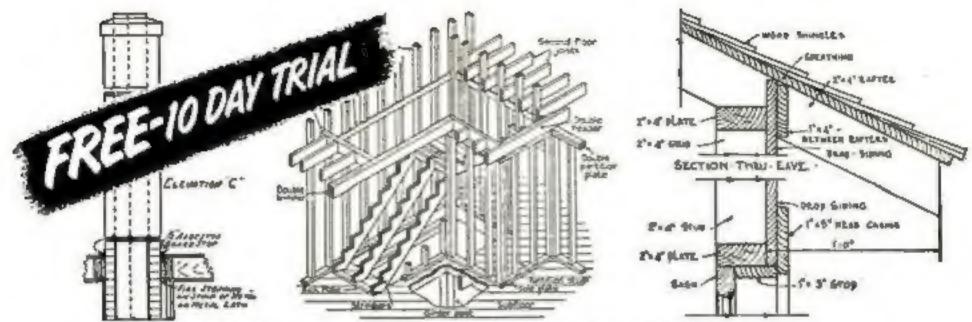
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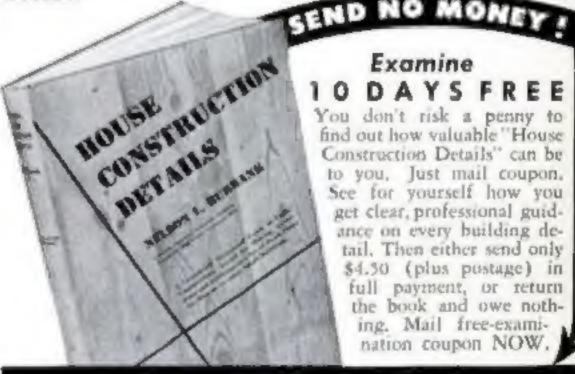
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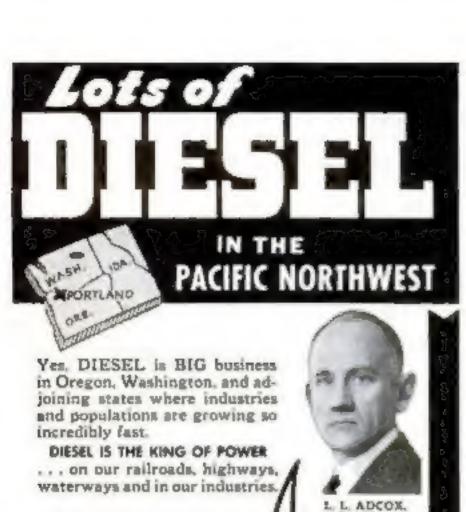
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Letters



Chicago Has a 'Chute Jump, Too

Sir:

Your article "How You Are Thrilled . . . but Not Killed" was very interesting, but the statement made on page 87 that the parachute jump at Coney Island's Steeplechase Park is the only one of its kind set me wondering.

Living in Chicago, I have gone to Riverview Park and ridden on the parachute jump there. And according to your picture of the jump, I find no difference. Am I wrong?

(Mrs.) ANN RUBACK

Chicago, Ill.

Reader Ruback is one of many loyal Chicagoans who jumped to the aid of their native city by chiding PS for this omission.

Got a Screw Loose?

Sir:

Here's a helpful hint to the owners of cars who like to keep them in shape and fix small items that have gone on the blink.

I have found in various places on autos, especially the older ones, that the screws which hold the framework around the windows and windshields on the inside have become loose, and in some cases won't tighten up sufficiently to hold the frame.

I have found that an excellent way to help this is by taking the screw out and stuffing a small wad of steel wool in the hole, re-inserting the screw and tightening it again. This has worked time and again for me.

THOMAS M. CARLYLE

Englewood, Colo.

Then a Tire Blows . . .

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In your editorial on the new cars (April, p. 103) there was a paragraph that said that cars must be made for use: "That they are not going to be parked in the middle of a five-acre field, or driven only on lonely roads." That is very appropriate to the point I wish to make.

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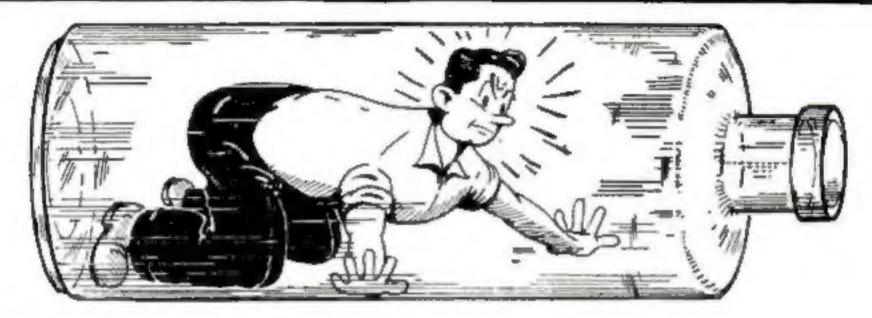
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Mr. R. C. Anderson, President

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R. C. Anderson Prosident

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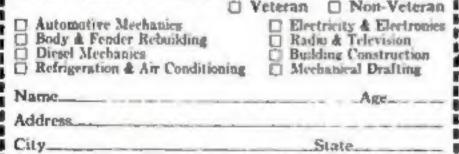
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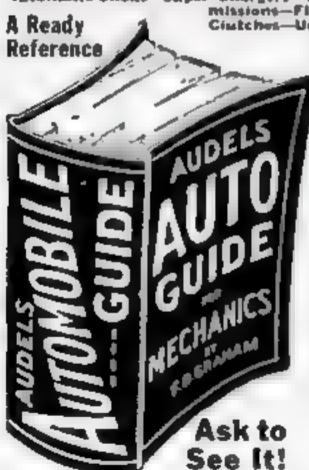
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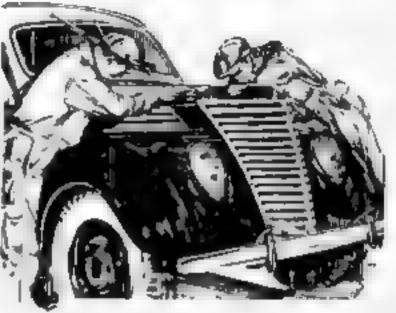


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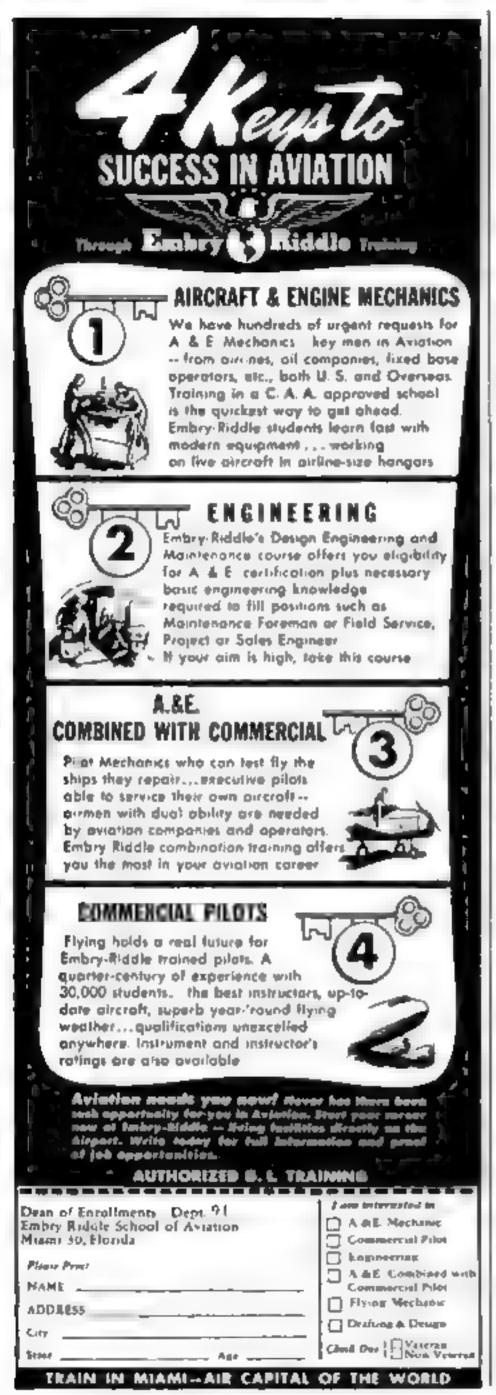
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how its spare tire is carried at the side of the cargo compartment, bolted to the inside of the dummy left rear door.

Now, suppose the car is driven up to a camp in the mountains some dark and ramy night. There is a lot of bulky and/or perishable material in the rear and it is really packed in—as shown in your cover picture.

Then a tire blows. HOW IS THAT TIRE GOING TO BE COTTEN OUT OF THE BACK COMPARTMENT?

PHILIP K. SCHMIDT

Plainville, Conn.

Answering your question is another item for the unfinished business of making cars for use as well as looks.

Merry-Go-Round Won't Go Round

Sir:

I subscribed to FOPULAR SCIENCE for my son so that he would grow up with an interest in science and mechanics.

I wouldn't like him to design a Merry-Go-Round like the one shown on page 84 of the July issue ["How You Are Thrilled . . . but Not Killed"]. Why don't you give your artist a free subscription to POPULAR SCIENCE so that he can learn the fundamentals.

IAMES W. MOLLER

Tulare, Calif.





PS has given artist Pioch a free subscription, in return for which he has redesigned our merry-go-round, as shown above, so that it won't tear itself to pieces.

Wax Saves Cement

Sir:

On page 209, in the June issue of Popu-LAR SCIENCE, appeared "Model Parts Molded from Metallic Cements." I advise that after the mold hardens, especially when using



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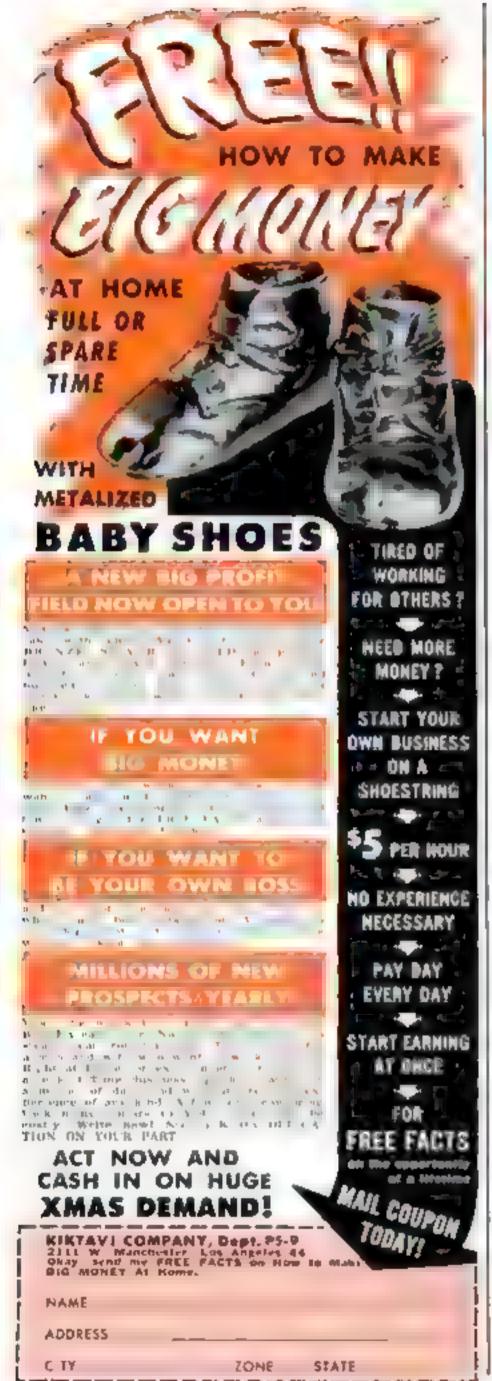


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large amounts of metallic cement for the subject, you test the mold by letting the wax from a burning candle run into it.

When the wax is removed, you will get a first-hand picture of what the object will look like from the wax impression. If the impression is not satisfactory, the mold can be done over, thus saving you quite a bit of metallic cement.

MORT KOSTIN

Brooklyn, N. Y.

Plays Make Progress

Sir:

On page 112, June issue, you show a picture of a new type of sagebrush plow, and you have given the U.S. Forest Service credit for developing the plow.

In 1947, along in the summer, the first plow of this type to be used in the U.S.A. came from Australia and was shipped to Boise, Idaho, and was hauled out and tried on the Idaho sugebrush. The reason the plow was tried out in Idaho, near Boise, is that there are several dams being constructed in the area, and there are many miles of irrigation ditches constructed near Caldwell, Idaho, which is about 75% sagebrush. The soil is good with irrigation, so a way had to be found to get the sagebrush out at a minimum of cost. This plow was shipped over from Australia, and that means the U. S. Forest Service did not develop it. CARROLL P. GRAVES

Bryte, Calif.

"stump-jumper," was first tested out at Boise and other places, but, giving the Australians due credit for their idea, the plow just wasn't rugged enough for the job. The Forest Service then incorporated its best features with those of several makes of American wheatland plows and came up with the "brushland" plow shown in PS Besides being less susceptible to breakage than the Australian model, the brushland plow has a more efficient knee action.

Pash-Button Problem

Sir:

I live in a four-room apartment and have many electrical apphances, including an electric mangle which runs on 14.6 amperes.

Every time the mangle and any other electrical appliances are turned on there is an



overload and the fuse blows. I have increased the strength of the fuses to 25 amps., but the fuses still blow. I don't want to put in any stronger fuses for fear of the wires overheating and causing fire. The trouble seems to be in the powerful mangle, as the fuse only blows while it is on.

I am sure that this problem faces many people in this push-button age. A solution

would be greatly appreciated.

PAUL S ROTH

The Bronx, N.Y.

The use of 25-amp, fuses in standard 15-amp, branch circuits is highly inadvisable, and in many communities illegal. The only safe, practical solution is to have a licensed electrician install a separate 30-amp, circuit for the mangle. Even though the mangle may run on 14.6 amp., its starting draw is doubtless much greater.

Whoopee for Whittling!

Sir:

I was greatly surprised to find not one but two whittling articles in your April issue. It seems that magazines for some unknown reason shun whittling projects. I don't see why because there must be many whittling fans who would like to see such articles.

I think the article "Miniature Game Bird Whittled from Pine" [p. 198] by M. P. Casserly was exceptionally good. The "Horned Toad" [p. 193] by Elma Waltner was also good. I am sure you will increase your sales if you publish projects like these.

Spurgeon S. Smith

Pennsauken, N. J.

Proof of the Pudding

Sir.

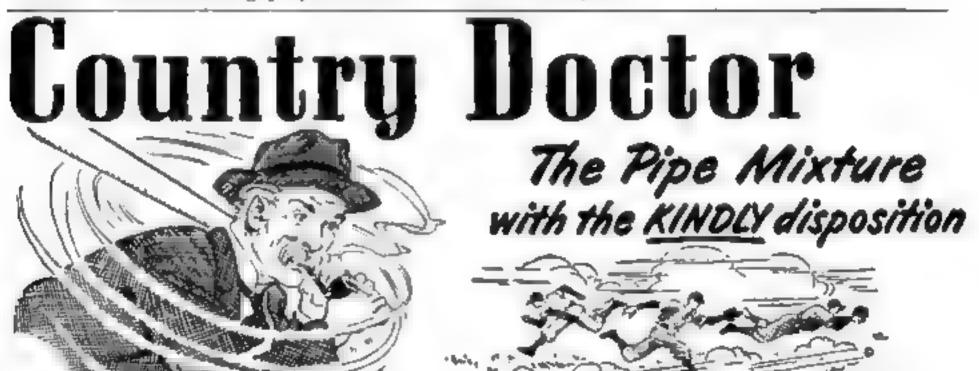
I most certainly enjoyed the article on "How Overdrive Works" in your April issue [p. 180]. On January 24, 1949 I purchased a 1949 Mercury Sport Sedan equipped with an overdrive. The Ford and Mercury dealer that sold me the car couldn't tell me very much about the overdrive, and after reading your article I discovered that what little they did tell me was all wrong.

It was very late in the evening when I finished the article, but I drove my Mercury around to see how the overdrive worked.

Your article is correct!

AMBROSE GEIMER

Decatur, Ind.



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A patent gives the inventor the exclusive right to prevent others from making, using, or selling the invention claimed in the patent for a period of seventeen years.

The Patent Laws were enacted for the benefit of the inventor to give him protection for the features of his invention which are patentable. These features must be properly and concisely set forth and claimed in a formal application for patent, in order to comply with the requirements of the Patent Laws. For that reason, unless the inventor is familiar with patent matters, he should engage a competent registered patent attorney or agent to represent him. We are registered to practice before the U.S. Patent Office and are prepared to serve you in the handling of your patent matters.

A specially prepared booklet entitled "Patent Guide for the Inventor", containing detailed information with respect to patent protection and procedure, together with a "Record of Inventor" form will be promptly forwarded to you without obligation upon request.

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If an inventor believes he has an invention, a search of the most pertinent prior U. S. patents should be made and a report obtained relative to its patentability. Where such report indicates that the invention appears patentable, in order to secure protection, diligence should be exercised in making application for a patent.

Send for a copy of Patent Booklet entitled "How To Protect Your Invention." This booklet contains information on patent protection and procedure. You will also receive an "Invention Record" blank. This will be promptly forwarded to you upon request—no obligation.

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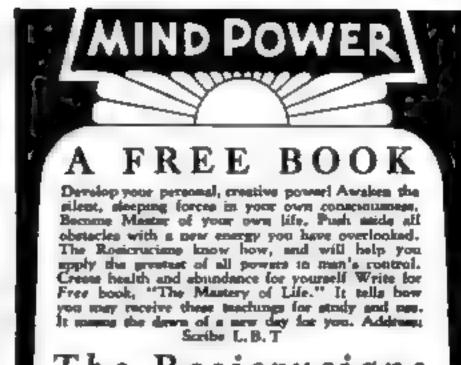
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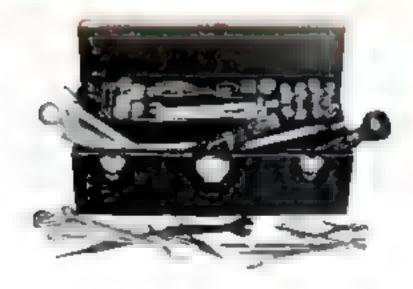
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For his guidance, the following are the usual preliminary steps which the inventor takes toward patent protection.

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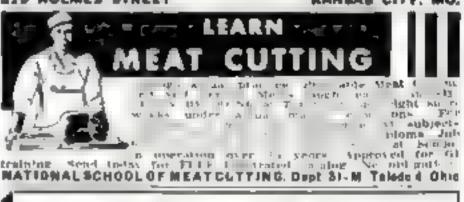
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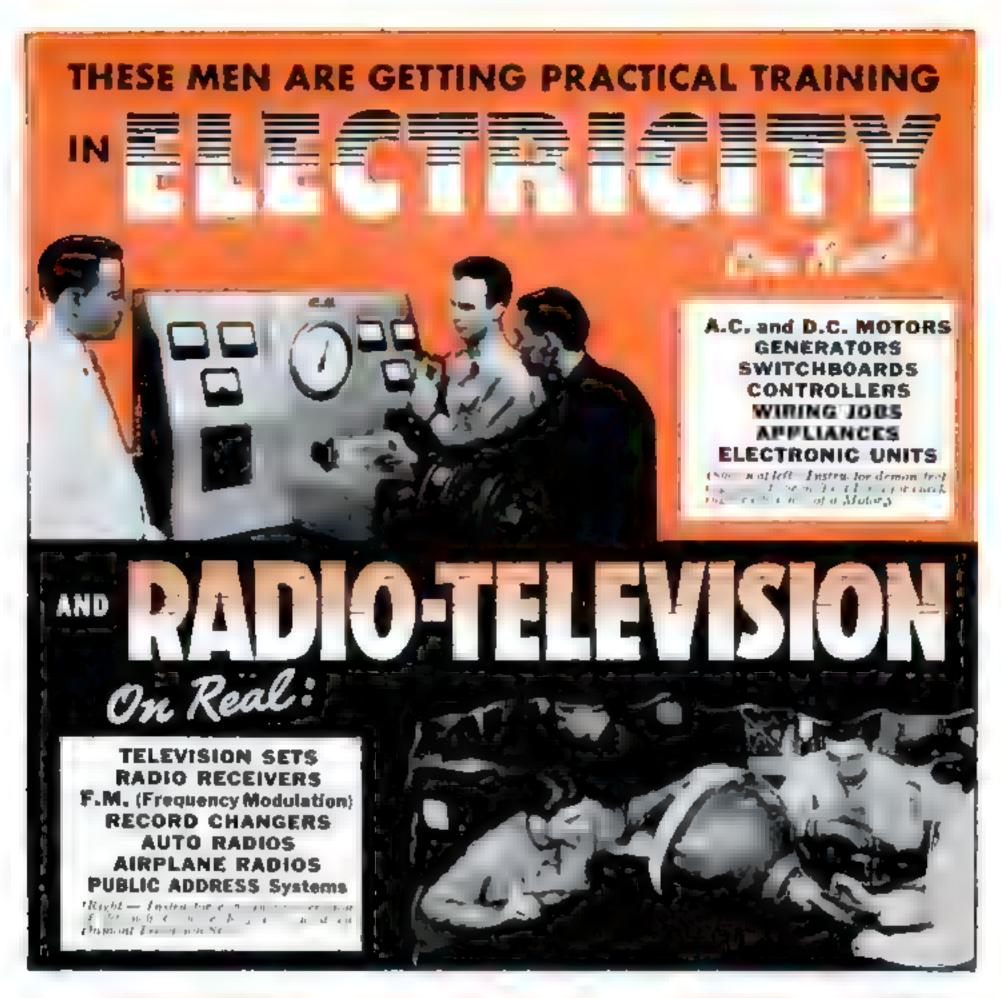
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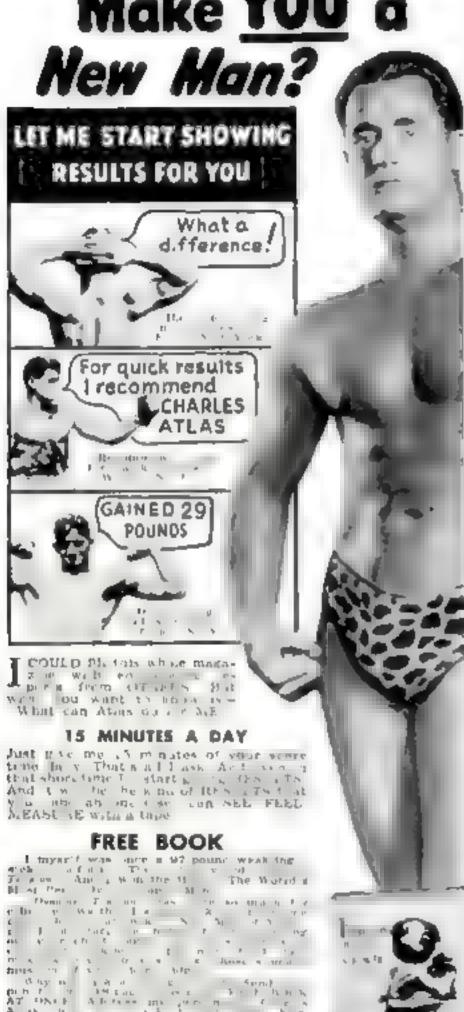
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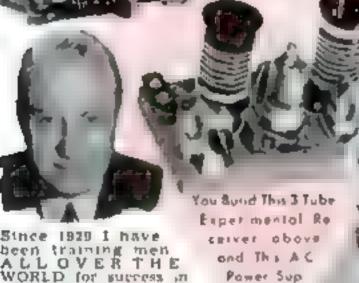
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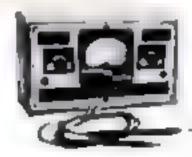
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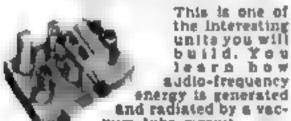
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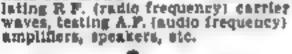
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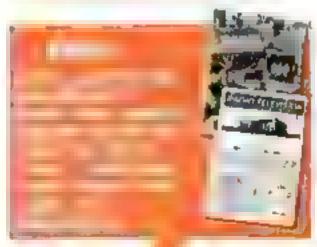
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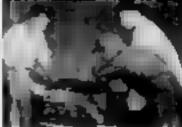
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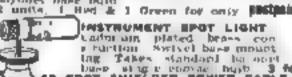
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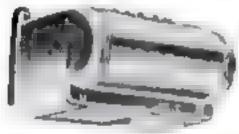
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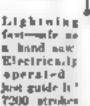
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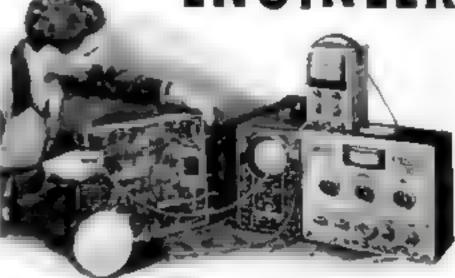
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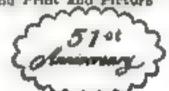


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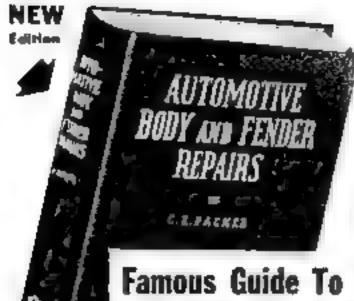
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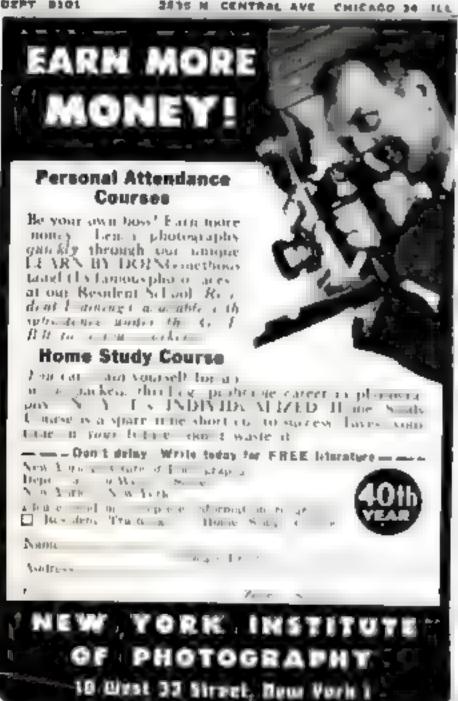
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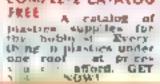
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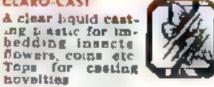
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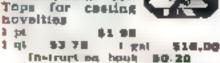
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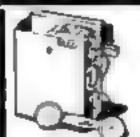
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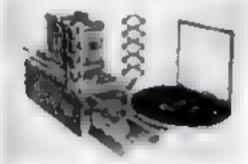
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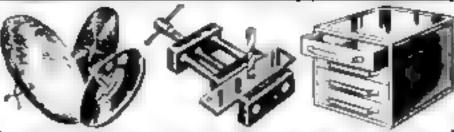
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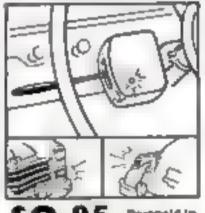


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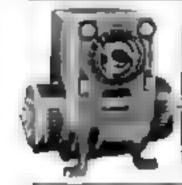
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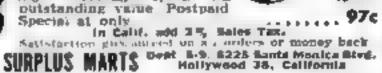
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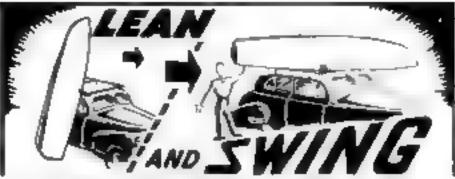
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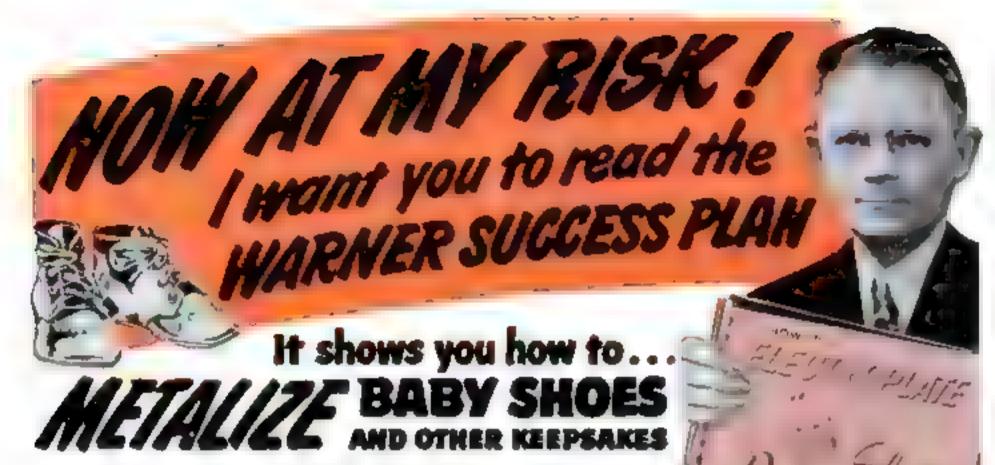
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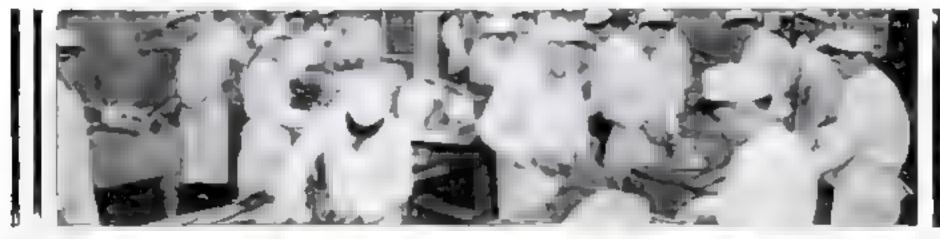
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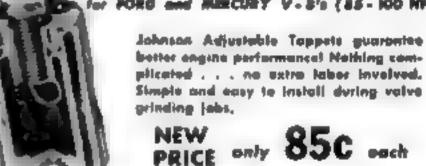
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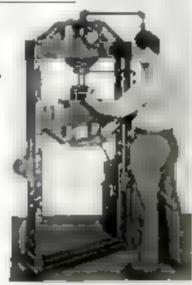
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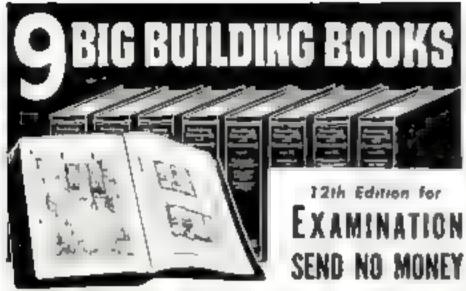
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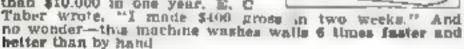
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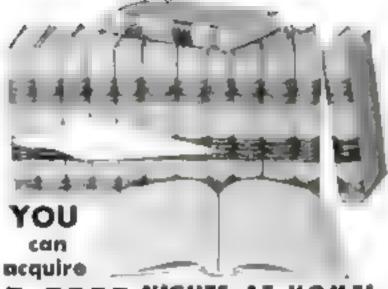


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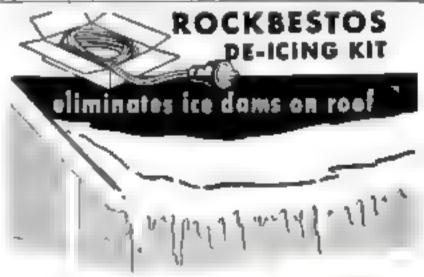
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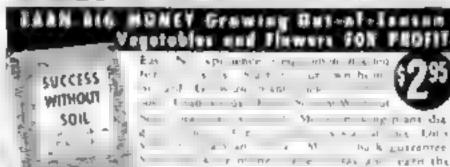
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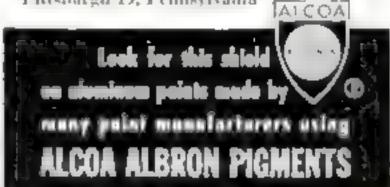
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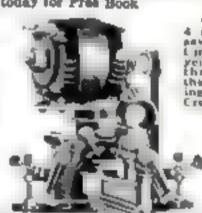
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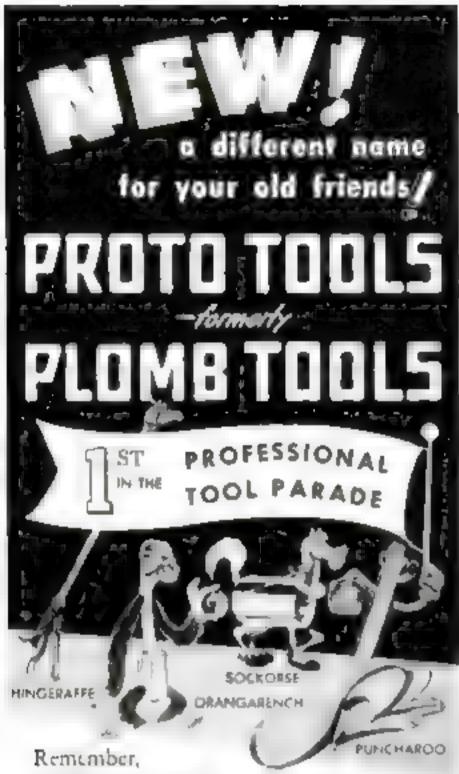


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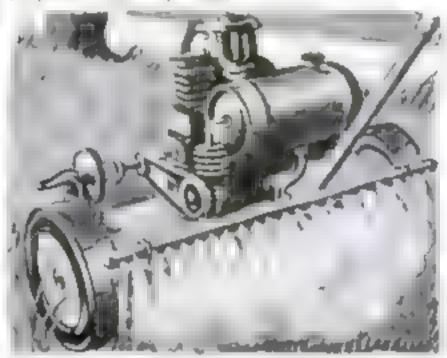
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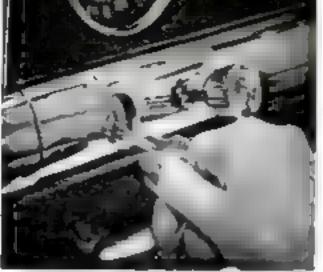
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Yes, it likes to be compared in ACTION, too!



center of Plymouth NERVE convenience is the new ignition key starting. Turn the key - the engine starts! Only Plymouth, in the lowest-priced field, has this feature.



are huskier. New MUSCLES cylinder head with @ compression ratio of 7 to I (highest of the leading lowest-priced cars) squeezes more performance from the fuel.





beautiful and practical, too! Although the new Plymouth illustrated here has a longer wheelbase, the over-all outside length is less. It's an easier car to park and handle.



on the circuits is held by this great little firewarden, Heat from a "short" makes it lift and break the circuit until the trouble has gone. No more replacing of fuses!

CHECK

the new Quality Chart at your Plymouth dealer's. Compare the three leading lowest-priced cars. Then drive the great new Plymouth and let the ride decide!

PLYMOUTH Division of CHRYSLER CORPORATION, Detroit 31, Michigan





RCA Laboratories developed a copper mesh with 2,250,000 tiny openings to the square inch for the television camera "eye."

You get finer television pictures through this super-fine mesh

In RCA Image Orthicon television cameras you will find
a super-fine copper mesh.
Until a new technique for
making this type of screen
was discovered at RCA Laboratories, only coarse and
irregular mesh—which obstructed 60% of the picture
—was available.

Today, through RCA research, such mesh can be made with 1500 gossamer wires to the linear inch. An ordinary pinhead will cover about 7000 of its tiny openings.

By RCA's technique—now producing commercial quantities of 200- and 500-mesh screens—the mesh is so fine, so regular in structure, that it is invisible on home television receivers . . . and as much as 85% more television picture passes through.

You benefit-many times

This new type of super-fine wire mesh, like most major

developments in all-electronic television, is another RCA Laboratories first. Leadership in science and engineering adds value beyond price to any product or service of RCA and RCA Victor.

The nessent developments in radio, telecision, and electronics may be seen in action at RCA Exhibition Hall, 36 West 49th Street, N. Y. Admission is free, and you are cordially insited. Radio Corporation of America, Radio City, N. Y. 20.



RADIO CORPORATION of AMERICA

World Leader in Radio - First in Television







You don't need to know music. You don't have to finger an instrument, or write music, or even read it, to listen or dance.

And certainly nobody expects you to pass an examination in the complex process between the first clunk and the last note. It would be hard for anybody to explain the whole business of converting an unheard humming in the composer's head into the coded dots of written music, the sound waves of voice and orchestra; the grooves in plastic, needled back into sound waves, which tickle the tiny bones of the ear—and put the humming into your head.

Science is something like music; you don't have to know it to get it. Like music, science has its own language. And it is as impossible to put "nuclear fission" into everyday words as it is to spell out the hit songs of "South Pacific" to a naked native of the real South Pacific.

But playing the tunes will put the beat in his feet

Ever since Haroshima, POPULAR SCIENCE has been beating the drum for the Big Science Show. Not to simplify science—for that cannot be done, any more than a whole orchestra can be expressed with a couple of sticks on a taut skin. Not to enlist the fullest comprehension of the few—for that is not the function of the most widely read science

magazine in the world. Rather to arouse as many people as possible to awareness of the new importance of science.

We think you ought to know that Public Science has become the biggest nickel-snatcher in the country. That you ought to listen, whether you can tell one atomic note from another, to the new recordings of the big experimental bands now playing the strange new tunes we must all dance to.

These hit tunes of the Big Science Show are hard to take. They have unfamiliar words and melodies. Words like "neutron" and "proton" and "meson." But you can remember when the words "nuclear fission" were strangers to the news. The important thing today is not how many comprehend the process, but how many accept the effect.

If you really want to know the electronics and physiology between your nickel and your ear, that's good. But don't think you must read or write science to catch the best of its new tunes. Or grasp the meaning to accept the significance.

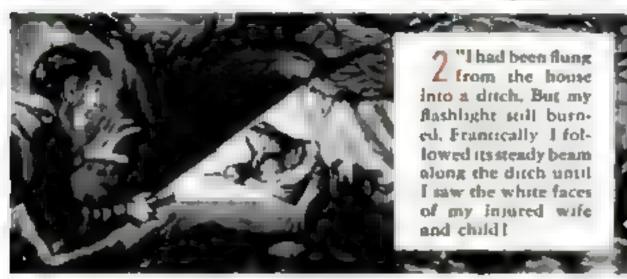
Don't worry about the words in this or any other issue of POPULAR SCIENCE. Some of them are new to scientists, too. Just lend an ear, because Public Science is playing on your nickel, your life—and ours.

And you own the juke box.

Penny Githing



"Near midnight, we heard it! A sighing whisper . . . a whining gust of wind ... a shricking blast! The full fury of the tornado struck! My wife screamed! My child whimpered, I grabbed my flashlight, Suddenly ... the whole house churned ... spun in air,



With the help J ofourflashlight. we reached shelter, 1 thank those flashlight batteries for saving three lives that night. Now I know why Everendy' batteries are The Batteries With 'Nine Lives'!'

Just as an active cat...takes a cat nap ...and bounces back with new pep...so "Eveready"

flashlight batteries recover power* between uses and bounce back

 Technical explanation r due to the electropercretion of the depolarizer.

tor extra life!



"Everyady," "Nine Lives" and the Cat Symbol are trade-marks of

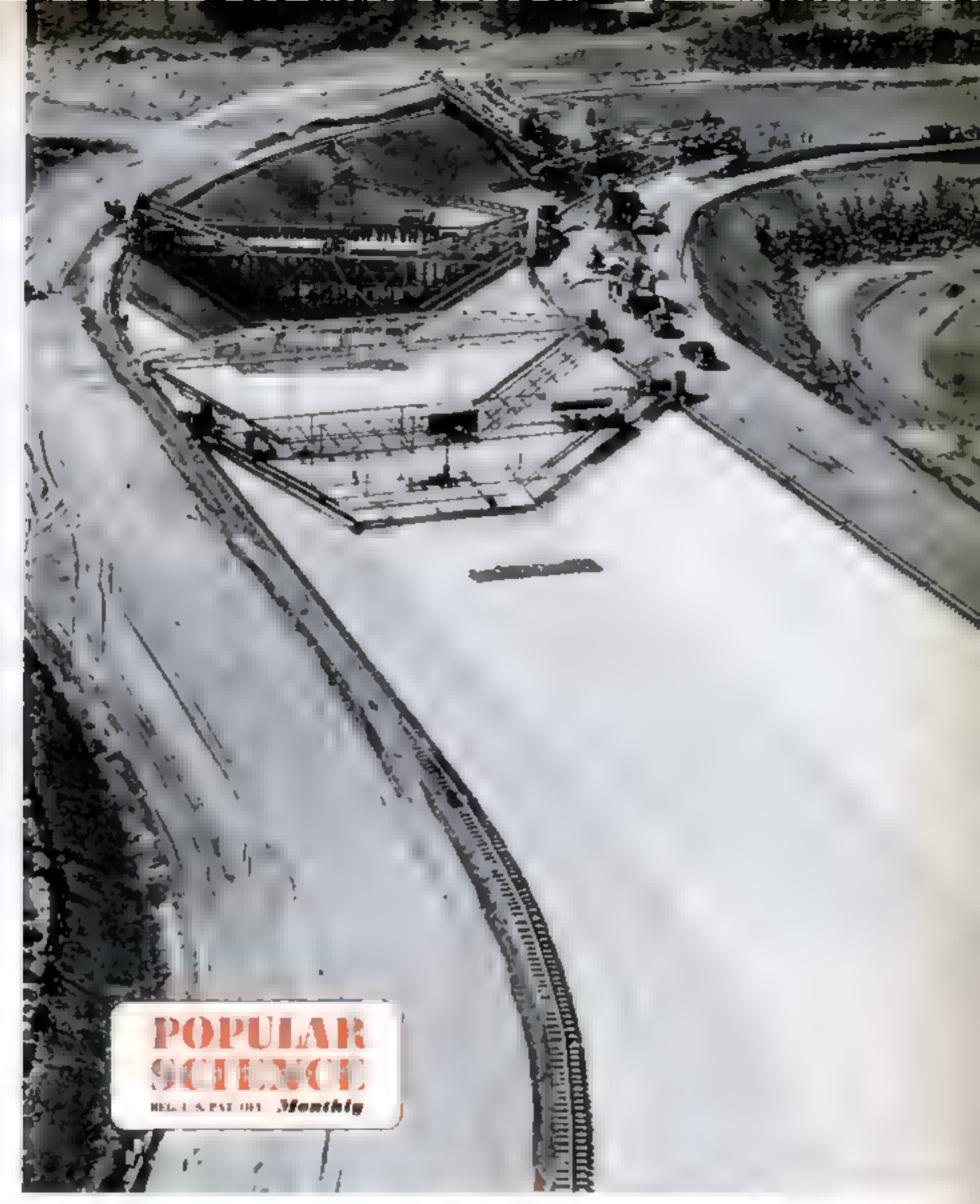
NATIONAL CARBON COMPANY, INC.

30 East 42nd Street, New York 17, N. Y.

Unit of Union Carbide Mile and Carbon Corporation

Write us about your true experiences with "Everendy" betteries, Address Dept. P.S.





project would make a fine speedway—if it didn't have a more important job. The giant ditch is the main canal of the Columbia Basin Project, soon to irrigate 1,250,000 acres of potentially fertile desert in Washington State. The life giving water will be pumped from Lake Roosevelt behind Coulee Dam to a storage reservoir (PS, Aug. '49, p. 156) and then will flow through this canal to the farm area. Paving the canal requires these four machines: at top is the trimmer, which prepares the foundation; next the lining machine, to place the concrete, then a "jumbo" that makes expansion grooves and also carries workmen doing hand-finishing, and last in line, a form with equipment to spray curing compound on the fresh concrete.



Studebaker Champions! of three vintages show the striking changes nude in last nine years.

Studebaker's New Aero Nose

Designers abandon boxy front for sharp streamlining: engineers add tuned springs to smooth rough roads.

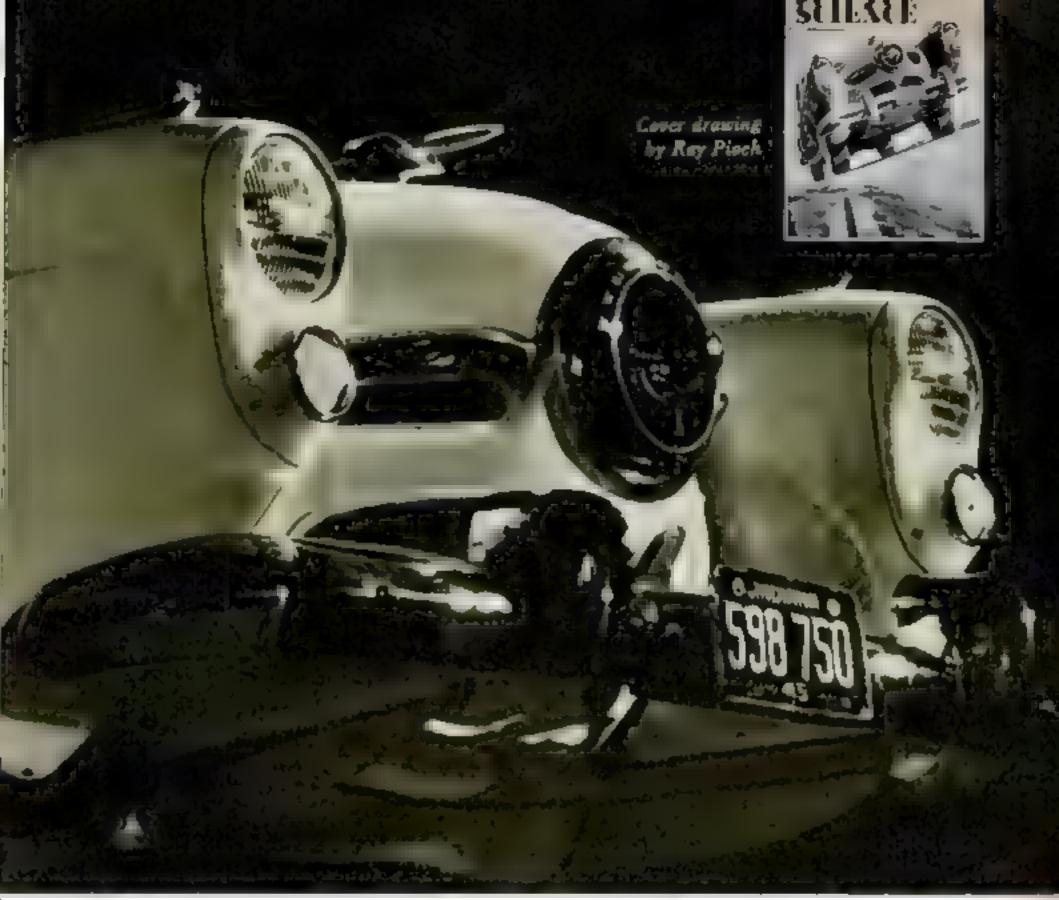
By Devon Francis

WHEN the late war was in its last months, the Studebaker Corp pioneer automobile builder called its designers into conference. The company's top hands wanted a new car that would be radical enough to make the public whistle and buy

The designers produced it. And every-

body knows what happened. The cars with the wrap-around glass and the front and back ends that looked alike got as thick as fleas on the highway.

Late last month Studebaker did it again. The public whistled again—with good reason. For the 1950 Studebakers put on display were as radical a departure from conventional design as were the ears the company produced just after the war.



Stylists seeking departure from boxlike appearance of today's cars adopted sirplane motif.

Reverses Styling Trend

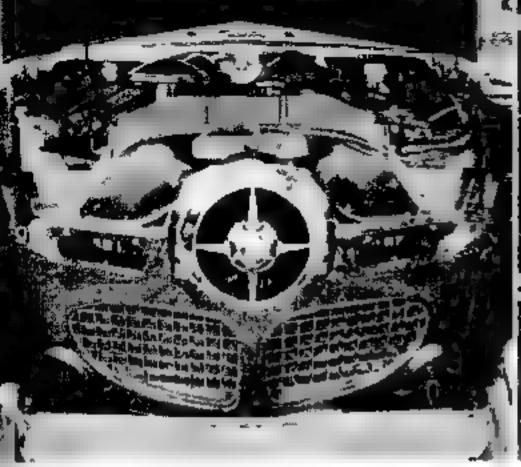
Their front ends look like the noses of transport airplanes—which is exactly what the stylists intended. Beyond the way they look is something else—a riding quality that should make their owners the most boastful bores in town

Here's the way Raymond Loewy Associates, the industrial designers who have been styling Studebakers for years, explain the appearance of the 1950 series:

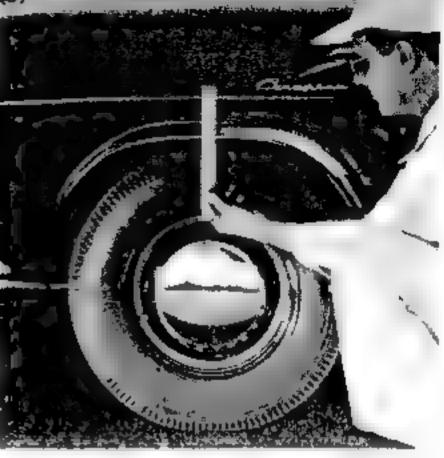
"We aimed for the light, fast impression of an airplane. We felt that it was time to get away from the 'forehead hood' that had been used in practically all automobiles for years. We wanted to break up the boxiske appearance that has been common to all postwar cars

"If we could give our cars a feeling of motion and speed, we'd have succeeded in going directly against the current trend. What better way was there to do it than to peel the car away from the front of the hood? The car now cuts its way through the air, bke an airplane."

There was a consideration, a lesser one, apart from appearance, too. An automobile burns gasoline mainly to overcome friction. That comes down mostly to the



Compactness dictated by the styling so altered the flow of cooling air that baffles had to be inserted behind inlets in guile. One baffle, to capture air at top, is seen above emblem.



Workman shows how far the wheel travels while compressing spring after bump. Commander, Land Cruiser—companions to Champion above—have 120-, 124-in, wheelbases.

friction of the machinery and friction with the road. But friction with the air cannot be forgotten, either. A head wind is quite an item with the big highway freighters (PS, Mar. '49, p. 128). Studebaker feels that a car with a boxlike front end has to displace an awful lot of air at today's smart clips on the open road.

Aero Noses Waited Two Years

And finally there was the consideration of sales. Studebaker, still selling cars that it hasn't produced in what generally has shaken down to a buyers' market, wanted a shot in the arm for the guy meandering around a salesroom floor with an itch to buy. As a matter of fact, the styling for 1950 has been on ice for two years. There were men in the company who were arguing for the airplane-nose car back in 1947. They lost. Older heads said it wasn't time yet for that design.

Candidly, not much else has been done to the 1950 series back of the front end-until you come to the suspension. Front fenders are jaunty and have been extended several inches beyond the point reached in current Studebakers. That's another result of the stylists' attack on boxlike fronts. Minor modifications have been made to the rear fenders.

Bodies are practically unchanged. The wrap-around glass, perhaps the chief aesthetic appeal of the first postwar Studebakers, remains the same. Engines—with their high economy—and transmissions are

right off yesterday's production lines. Concessions to the sales department have been made in the appearance of the instrument panel. The changes are efficacious. For one thing, recessing the dials prevents any possibility of their picking up glare.

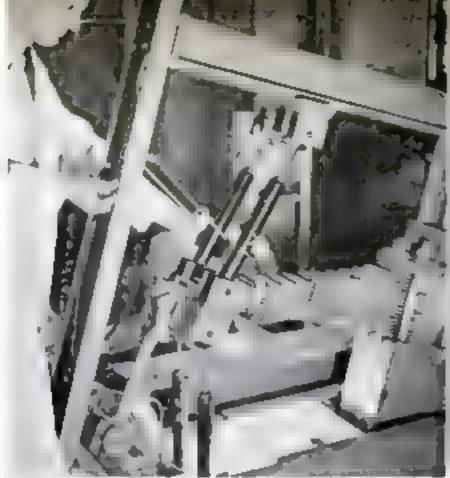
The other important item in the new cars is the springing. For the first time, coil springs have replaced the transverse spring in front. But that's only incidental, What Studebaker has done is make a meticulous study of the whole subject of bumps and vibrations—and how to keep them from becoming uncomfortable.

As the representative of POPULAR SCIENCE at Studebaker's proving ground west of South Bend, Ind., months ago, when the 1950 cars were on their shake-'em-apart tests, I passed off the change in the springing as another one of those things—until I drove the cars. Don't let anyone tell you that you can't pilot one of these automobiles down a washboard road at 50 to 60 in comfort. I did,

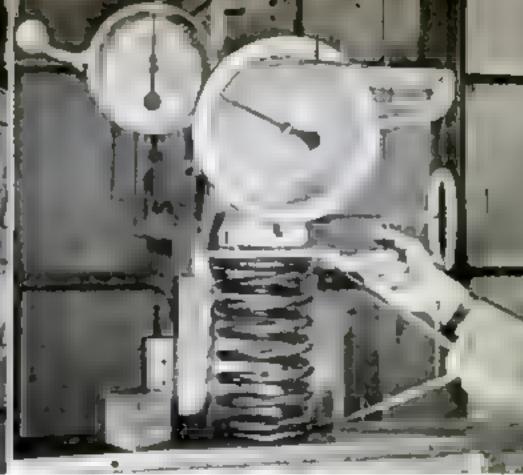
New Cars Smooth at Top Speed

First I took the Champion⁹, Commander⁹, and Land Cruiser⁹, the company's three models, out on the oblong and dished speed track, rated at 80 m. p. h. It took me several tries before I could make myself keep the accelerator down on the turns. It was Francis versus Faith, and Faith kept losing. But eventually I found that even at top speeds the cars rode like Pullmans.

Then I drove the cars-and three com-



Technician directs stream of cooling air on shock absorbers, which are getting a 3,000-lb. load 16 times a minute from 17-plate spring. Calibrating springs eases ride on rough roads.



In choosing front coil springs to replace former transverse type, they were tested for carrying height and "rate" Here engineer measures spring for characteristics under 1,625-lb, load.



New Studebaker takes a bump at 40 m.p.h. on proving ground's "Route 1," Single mile of it is considered equal to 8 to 10 miles on normal rough road. Each test car got 600 miles of this.



Violent side-to-side gyrations of leaf spring as one of rear wheels lots a bump are shown in this photo. Objective was to find ways to minimize spring wear and side motion of ear body.

petitive cars—on the hill-and-dale, gravel, bumpy, and washboard roads at the proving ground. These Studebakers were all hand-made machines. The production jobs will even improve the performance.

I hit bumps at 35 and 40 that almost shook out my eyeteeth in anything but the 1950 Studebakers. I included alternately spaced bumps to whack each wheel separately. The new cars had a remarkable glide and shock-recovery. I won't say the washboards didn't set up vibration. They did. But it was not unpleasant.

Curious, I went to see the engineer in charge of springing and shock-absorber calibration at the factory. First off, he asked, "Who's going to ride in these automobiles? People. So why not use the human body as a laboratory in finding out what we need in the way of vibration frequency?"

He said: "You can't eliminate vibration, but you can attune it to the vibration frequency the human body is accustomed to."

Springs have two performance attributes: rate and frequency. Rate is the amount of load it takes to deflect a spring one inch. Frequency is the number of times a spring will go up and down each minute if it is disturbed. The proper rate is necessary to carry the load. The proper frequency, like that in a violin string, is necessary to



produce a given result—in this case, to keep driver and passengers happy.

Keeping them happy goes back to the frequency the adult body likes. The body can take between 70 and 100 shocks a minute with composure. That's based on the shocks encountered in walking—your heels hit the ground 70 to 100 times a minute when you walk two or three miles an hour with a 30 inch stride. You scarcely notice the jar because you are used to it

Softening Springs Increases Rate

So, when the new Studebakers are fully loaded, their springs have a cycle (or frequency) of 80 in front, where the weight is greater, and 70 in the rear. To get low frequencies, the springs had to be made so that they would deflect easier and farther. That posed the problem of wheel travel. So when the wheels hit a bump and go up, on the compression stroke, the travel is a full four inches. On the rebound it's a full five mehes, Studebaker had to do some finagling with wheel housings to give the wheels room to move in.

One other item entered into the suspension. A "rake angle" of 5 degrees was engineered into the wheel mounting; when a wheel hits a bump, it rebounds backward away from the bump. This was accomplished in the new design merely by canting the support arm.

The shock absorbers were corrected to 100 cycles a minute. That was a compromise. Actually, on a washboard road at 40 miles an hour, you are likely to get as many as 600 vibrations a minute.

Transverse Movement Also Limited

Studebaker's study of the riding qualities of its new models was intended to limit all four of the motions resulting from the impact of road irregularities on the wheels—roll, pitch, up-and-down movement, and transverse movement

The transverse movement of the car comes from the wheels on one side hitting a bump. The front wheels bounce up and down in an arc, compounding the stresses. Regardless of whether it's a front or rear wheel, the movement is transmitted to the frame as a side-to-side stress. Sea-leg type of shocks in the rear help control this stress. So do rubber shackle bushings.

Paul G. Hoffman, the man who authored the first of the company's postwar cars, no longer is at the Studebaker helm. He's

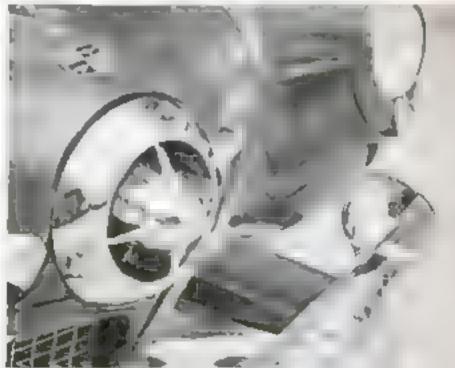


New Champion, with over-all length of 1975 m., projects 55 m. hevond front of 1949 version with wheels exactly aligned. New wheelbase of 113 m is oidy 1 m. longer bowever.



Shrinkage of under-hood space by abandonpoint of the fractional design posed housing problem Refiniter is canted backward to fit Bolted-on fenders are easy to replace, repair.

To add steekness and avoid any ppearance in heaviness in the front cost, the bimper back bars are not concealed by the griffe or the plan. He new car is wider, but height remains same





Instruments are centered in single housing in front of driver, Recessing them eliminates any

reflections. Controls and handle on glove compartment also are recessed as a safety measure.

the Covernment ECA administrator, apportioning billions of dollars for European recovery. But his verve infuses the South Bend organization.

One day before he was called to Washington, he had one of his favorite drivers at the plant take him and a friend to Terre Haute to catch a train. It was late when they started. The driver had to roll the car at 80 much of the way. Hoffman sat in the

back seat throughout the ride chatting easily, utterly relaxed. When they reached the station there were only three minutes to spare before train time.

"Have to do something about this," Hoffman remarked drily as he glanced at his watch. "We're wasting too much time on the road."

That may be one of the reasons for those new airplane-nosed Studebakers.

Foil-Carrying Balloons Find Right Spot for TV Antennas

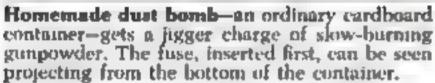
Balloons not much bigger than the ones kids play with are now helping television service men find the right place for video antennas.

The helium-filled Kytoons® actually carry a temporary antenna—strips of aluminum foil—up into the air to determine the height at which signals come in strongest. A special coaxial cable brings the signal from the aluminum-foil antenna to the ground and also controls the height of the balloon. The balloons are used in mountainous suburban areas where tall antenna mounts are needed to pick up a strong, "ghost"-free picture.

The Kytoons, which have dirigible-like fins to give extra lift and keep them steady in windy weather, can also be used to fly permanent antennas in remote locations where a roof or pole mount would give no image at all. The manufacturers, Dewey and Almy Chemical Co., of Cambridge, Mass., report that they have even shipped some to whalers—to locate newly killed whales.









Protective wadding is placed over the gunpowder and tamped down before a few ounces of insecticide dust are added. The lid is then put on, and bomb can be loaded into the bazooka.



This bazooka—an old cardboard mailing tube with one end closed—is a muzzle-loader. Explosion of the gunpowder charge does not injure the gun, which can be used over and over again.

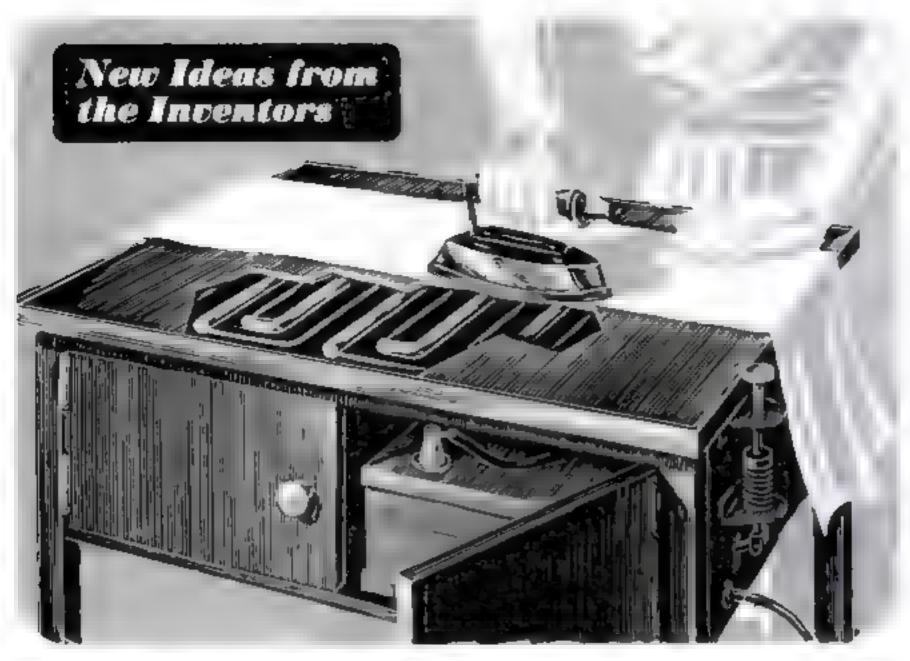


Ready, aire, fire! The fuse allows 12 seconds for pointing the bazooka at its target. One shot covers a small tree, or 1,000 square feet of level ground, with the insect-killing dust.

Paper Bazooka Kills Bugs

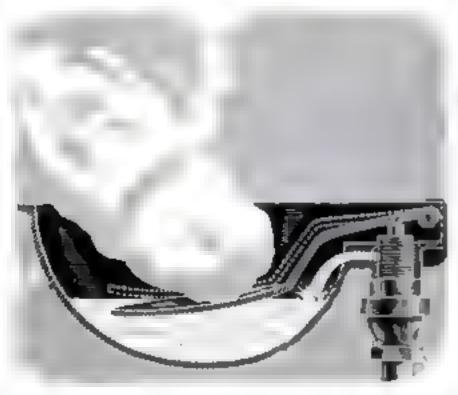
THIS bazooka fights in the never-ending war against bugs. Although made only of cardboard—an old mailing tube—it shoots down insects almost anywhere out of doors. With one shot, it can spread insecticide through the top of an apple tree or over an area of 1,000 square feet.

Robert Blair, of Washington State's Yakima Valley, designed the weapon to replace expensive spraying equipment for small-scale gardeners. The charge is a cardboard container—like those restaurants use for coffee—filled with slow-burning gunpowder and insecticide. In use, the dust bomb is slipped down the muzzle, the fuse is ignited, and the bazooka is simply pointed at the target. Various types of insect powders are used, depending on the bug to be eliminated.



From Can't Scorch. You couldn't scorch your clothing with this iron even if you left it right on the material. High-frequency electrodes under the table top create an electrostatic field between them and the

iron. When the cloth is damp, it absorbs energy from the field and becomes hot. As it dries, it absorbs less and less energy, losing its heat, and thus cannot burn. The inventor is E. C. Pitman, of Red Bank, N. J.



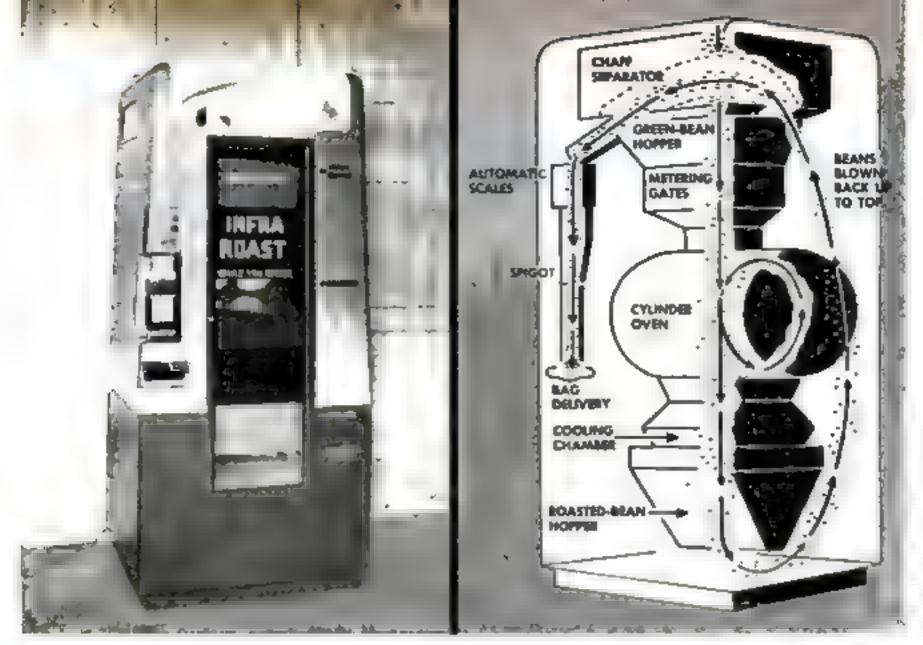
Drinking Dish Fills Itself. Thursty cattle wouldn't have to wait for a farmer to refill this watering bowl when it ran dry. Poking their heads into the bowl pushes down a hinged arm that opens a valve, letting water from a pipe flow in. When the arm is released, the flow stops. The bowl was invented by H. E. Bremer, of Milwaukee.



Baby Rides on Air. This novel baby carriage could be blown up like a rubber life raft. Double fabric walls with air in between form the sides, ends, and bottom, while a conventional folding hood attaches to the top. Deflated, the carriage folds up for easy storage and carrying. The inventor is M. W. Newberry, of South Windsor, Conn.



Conveyer Londs Condo Planes. these are telescoping conveyers that can be Speedier loading the second standard or retracted to reach different sizes planes is the second s



Machine Vends Roasted Coffee

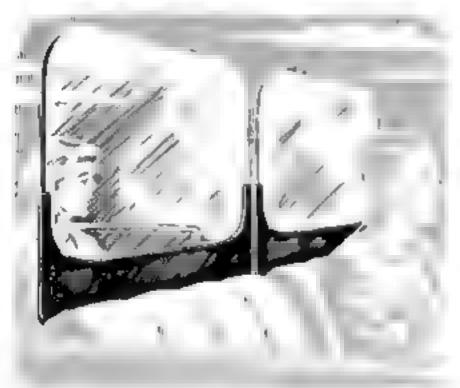
When you get your coffee out of this machina, you're sand to I rish coasted before your eves while you Roasts holes to above). There it is roasted by heat from infrared lamps controlled by a photoelectric unit that indges when it's done by how

s reflect PS, Nav

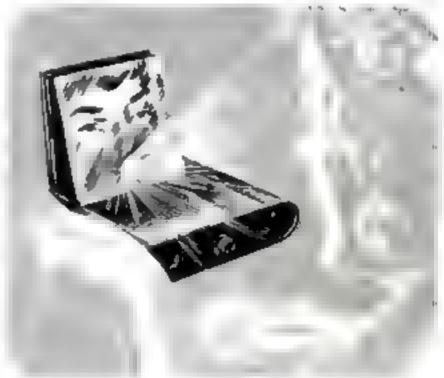


Conveyer Loads Cargo Planes. Speedier loading and unloading of cargo planes is the object of this conveyer system. Two main conveyers carry cargo between planes and the warehouse. In a circle around

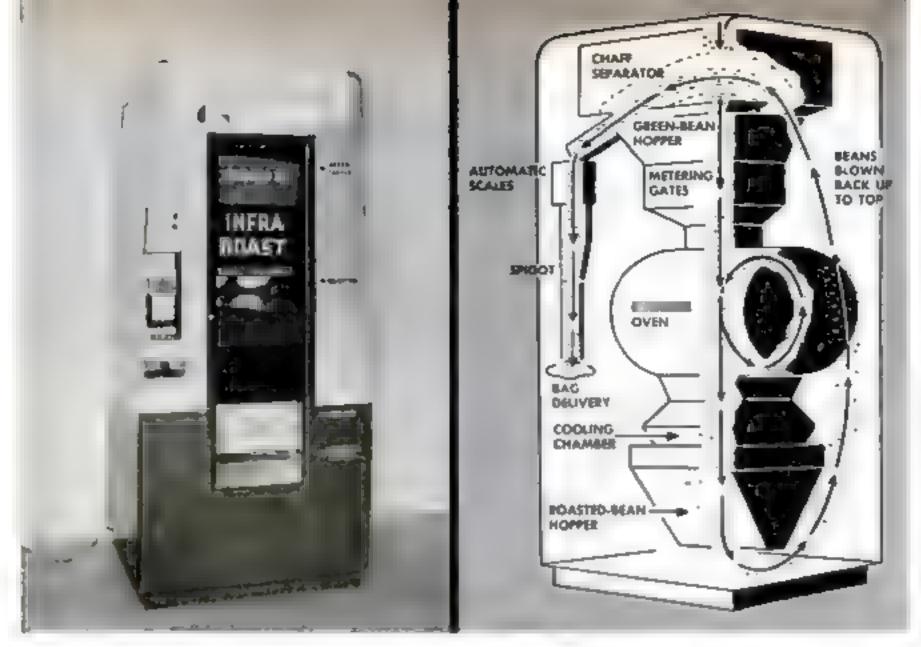
these are telescoping conveyers that can be extended or retracted to reach different sizes and numbers of planes. The inventors are J. Gonzalez, of Torreon, Mexico, and Y. Meer, of Wyckoff, N. J.



Shields Stop Open-Car Drafts. Like the old back-seat windshield, these clear-plastic shields for convertibles are designed to keep wind off passengers in the rear and back-of-the-neck drafts off the driver. Invented by W. Menrath, of Milwaukee, Wis., they are hinged at the top of the front seat, fold down when not in use.



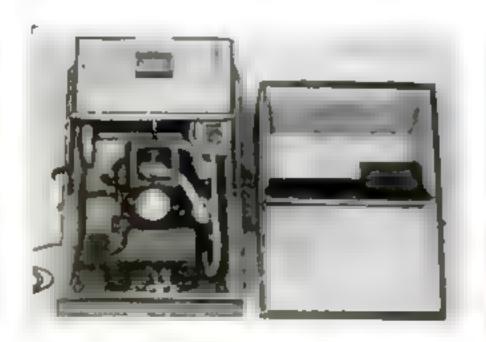
Compact Lights Up. Women could get their makeup on better in dark or poorly lighted places with the compact patented by J. S. Wachtel, of New York City. It has a small bulb at the bottom of the mirror that lights up the user's face. Electricity is supplied by two pencil-type flashlight batteries, one at each side of the case.



Machine Vends Roasted Coffee

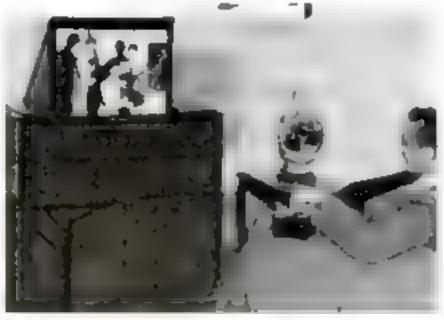
When you get your coffee out of this machine, you're sure it's fresh-masted right before your eyes while you wait. The Infra Roast® holds 150 pounds of green coffee and dispenses it, freshly roasted, at the rate of a pound a minute. The coffee goes first into a cylinder oven (see sketch at right

above). There it is roasted by heat from infrared lamps controlled by a photoelectric unit that judges when it's done by how much radiation the beans reflect (PS, Nov. '46, p. 214). It next falls into a cooling chamber and then into a hopper. As needed, it is blown up and across the top where the chaff is removed. Scales then measure out an even pound into a bag.



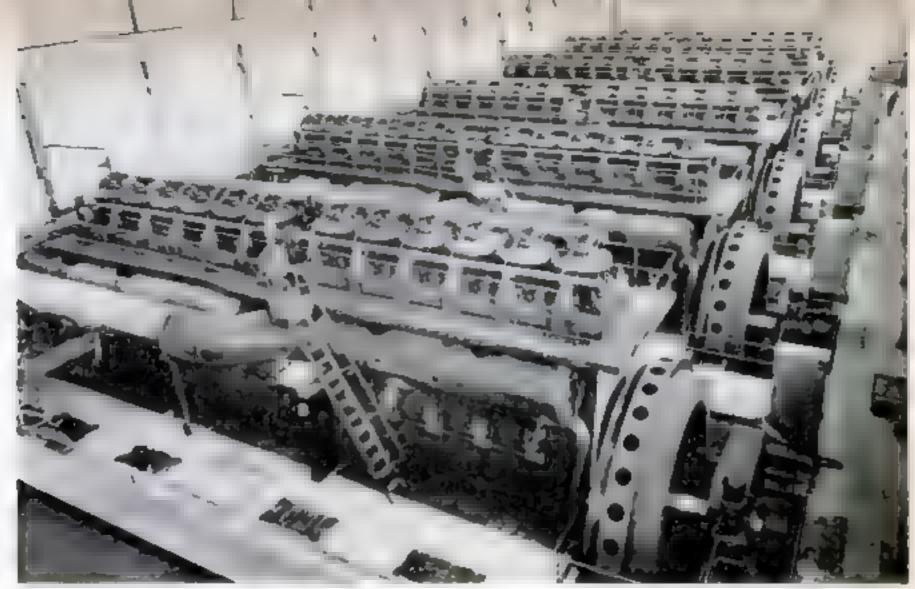
Glass Wool Muffles Generator

BEYOND 100 yards, you have to listen hard to hear this new 1%-kw. engine-generator above the chirp of a cricket. A labyrinth-like housing with a one-inch lining of Fiberglas[®] absorbs most of the noise. For front-line military use, the generator was designed by the Engineer Research and Development Laboratories, Fort Belvoir, Va.



TV Set Has Chairside Control

This new RCA Victor projection-type television set features a remote-control box that lets you adjust brightness and contrast without leaving your chair. Usually available in the past only as custom equipment, the unit, with its connecting cord, permits continual adjustment of these controls from up to 25 feet from the set.



Walkways indicate size of engines, 268 ft. long, generating electricity at new Mexico City plant,

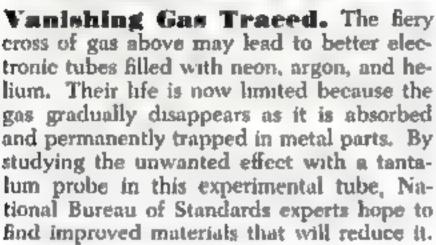
Mexico Gets Giant Diesel Generators

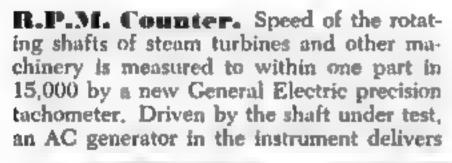
SIX of the largest Diesel engines ever built in the Western Herrisphere are row generating electricity for Mexico City. The new Tacubaya plant has a string of Nordberg Diesels each producing 7,350 kp. or 5.150. kilowatts, at Taci bava's 7,600-ft, altitude Lach has 12 cylinders of 29-in, bore, with a crankshaft weighing one ton per foot of length. Heavy Mexican oil, centratiged and bested before use, fuels the crigines.



Air intakes and exhaust mufflers are big, too. They are atop building housing all six engines.



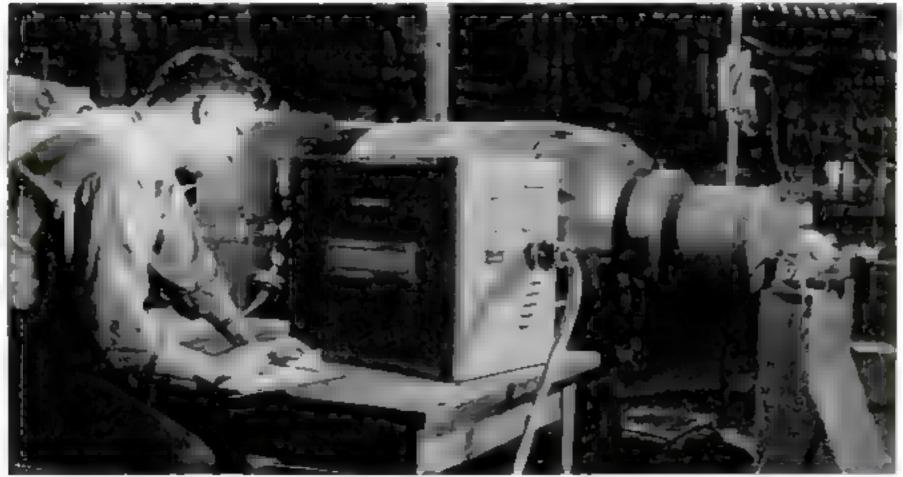


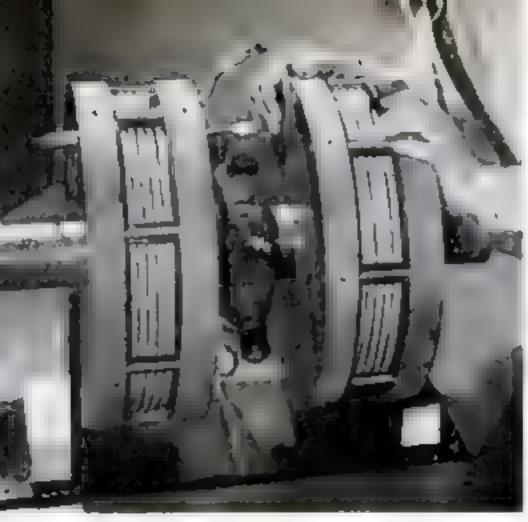




Tank Dunks Transformer. To assure perfect insulation for its windings, a high-voltage transformer core gets a dunking in oil in a huge vacuum tank like the one above at the Sunnyvale, Calif., Westinghouse Electric Corp. plant. After the air is drawn out, 10,000 gallons of insulating oil flow in, penetrating every pore in the coil covering. Finally, excess oil is drained and the 10-ton lid raised for inspection.

current whose frequency increases with speed. The frequency is translated into revolutions per minute by electronic circuits. These circuits light bulbs to flash a six-figure number once every second on the frosted-glass screen in the photo below.

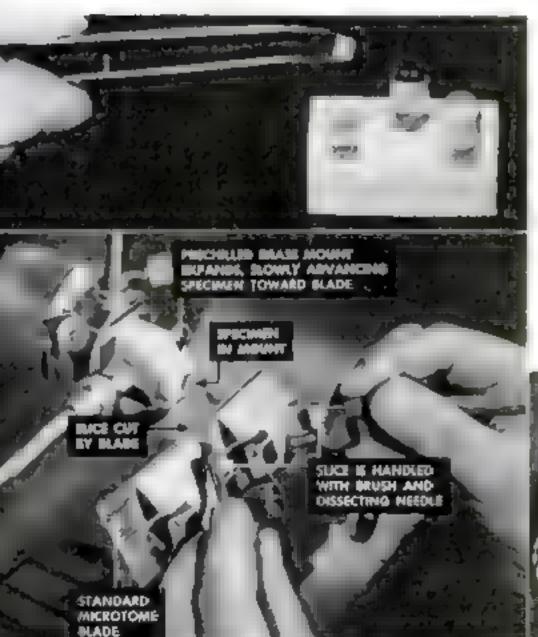




Baby Betatron. A midget among atom smashers, this 110-pound betatron packs a 9,000,000-electron-volt punch. Resembling a new GE 300,000,000-volt betatron (PS, Aug. '49, p. 148) in dispensing with a massive iron yoke, it stands at the opposite end of the size scale. It serves as a portable experimental tool in the Philips Research Laboratories at Endhoven Holland A "doughout tube" shows electron paths



Toe Tester. Second-to-second changes in the sizes of fingers and toes are measured by the device above. Blood pulsing through a digit dilates it enough to displace air in a plastic cup attached to it. This records a wavelike graph on moving film in a sensitive Brown Instruments recorder. The device, named a plethysmograph, from a Greek word meaning "an enlargement," helps doctors diagnose heart ailments.



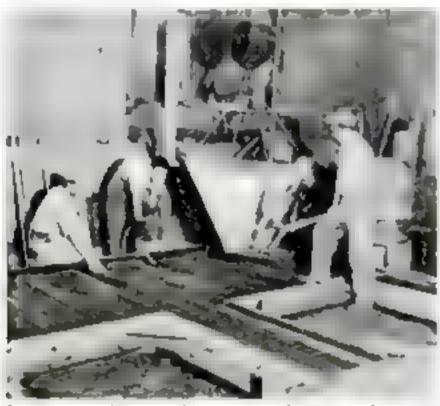
Citra-Thin Slices. Any worker now can slice tissue—such as the frog's-eve section below-thin enough for an electron interoscope's beam to penetrate it. In an ingulatus method developed by the National Bureau of Standards, the specimen is first placed (left) in a capsule of liquid plastic. Heated, this solidifies, embedding the specimen. Then it goes in a brass mount (lower left) chilled by carbon dioxide gas expanding through a needle valve. As the mount returns to room temperature, its expansion moves the plastic-held specimen less than .000039 in, under the blade.





Blocks of Foamglas® form the insulating core of this new concrete-and-glass building panel.

They are laid (above) after the first concrete veneer has been poured into the wooden form.

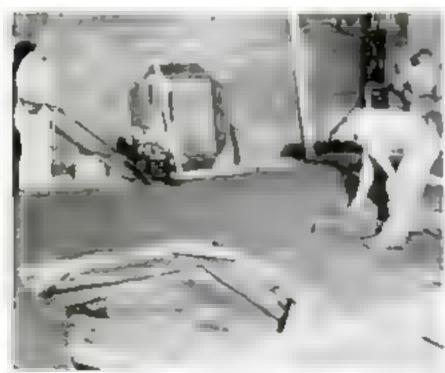


Pouring of second concrete layer is the next step (above). Each of the three layers in the "sandwich" is two inches thick, making a wall about half as thick as ordinary masonry walls

Glass, Concrete Make Wall Panels

CLASS is being used in a new kind of wall that is thinner and cheaper, yet offers better protection against weather. The new walls are sandwich punels, made of concrete with a "filling" of foamed-glass bricks.

The concrete-glass sandwiches can be made on the job in panels of any practical size. A layer of concrete is first poured in a flat form, the Pittsburgh Corning Foamglas[®] blocks are placed on it, and the second layer of concrete poured. One day later the panels are ready to be fastened to the building frame. While used first for "curtain"—non-load-bearing—walls in industrial structures, they're now being tested for use in homes.



Heavy mechanical troweling plus handwork complete the job. The exterior concrete veneer gets its finish at this point. The interior veneer can either be finished or prepared for plaster.



The wall panel is ready to be lifted by a crane and fastened to building framework 24 hours after concrete is poured Building above is walled almost exclusively with these panels.

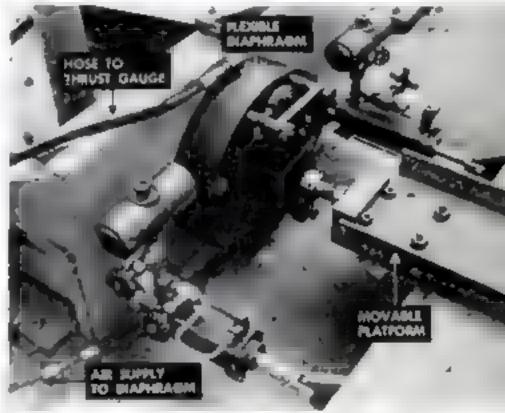


With pilot in the cockpit, the Panther carrierbased jet fighter above is on the stand being

readied for a routine thrust test. Its power plant is a Pratt & Whitney J-42 jet engine.



Compressed-nir bottle and gauge for the measuring system are mounted in this trader. One hose supplies air to the ThrusTorq® diaphragm, another hose leads back to the reading gauge



Close-up view above shows the ThrusTorq®, the large cylindrical unit in the center. Dampers flanking it minimize lateral movement of the platform on which the jet aircraft stands.

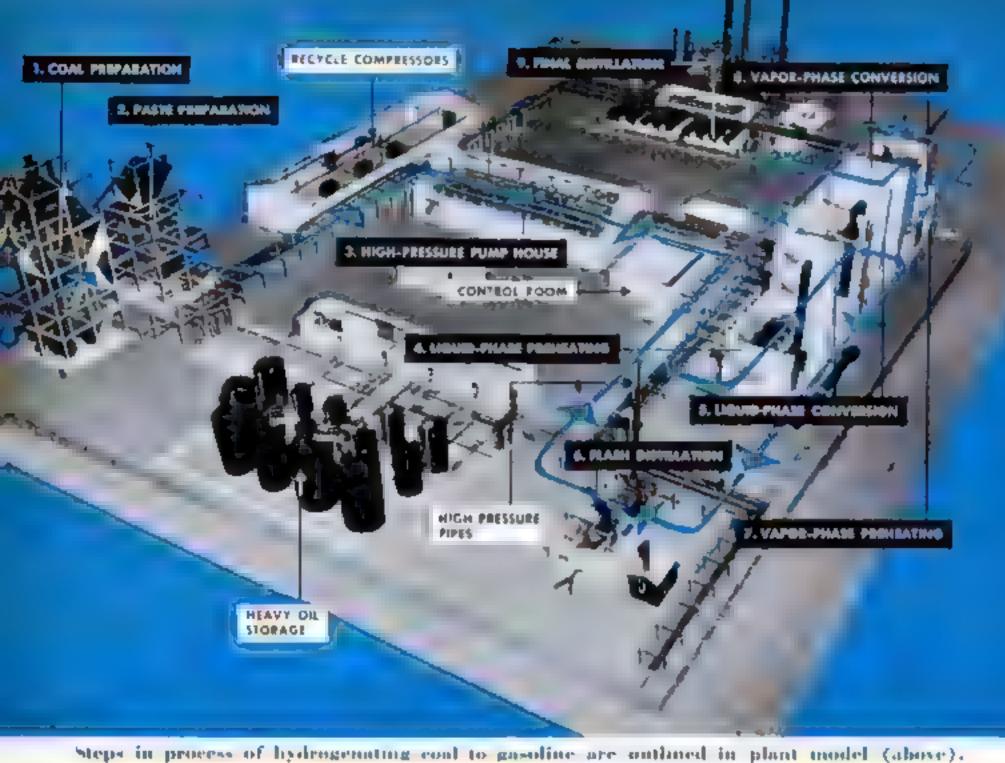
Platform Scale Feels Jet's Muscle

HOW to measure a jet's thrust—the equivalent of horsepower in a piston-engined plane—without actually flying the plane has been neatly solved by Grumman engineers. They literally put the plane on the stand—a new device called a thruststand.

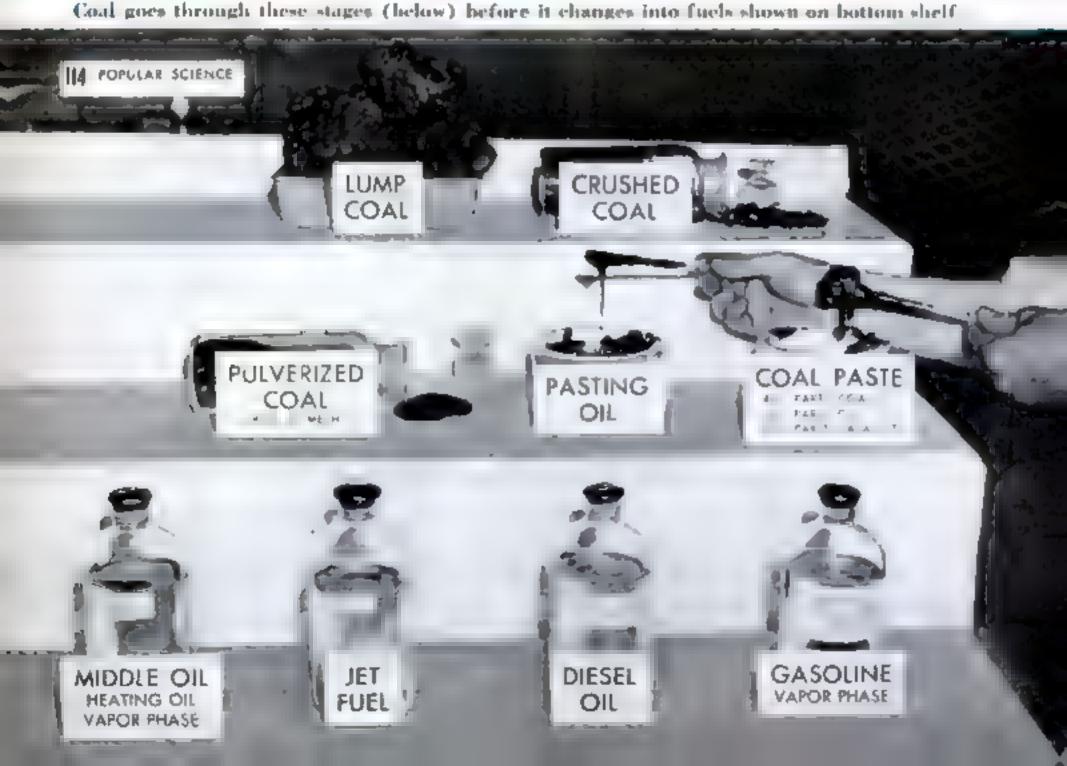
The plane is towed up a ramp and imprisoned on a movable platform. As the engine is started, it thrusts forward according to the speed of the engine. But instead

of taking off, it exerts this thrust against one side of a flexible diaphragm in a Hagan ThrusTorq[®] meter. At the same time, just enough air pressure to balance the thrust is applied to the other side. The amount of air pressure needed is thus a direct measurement of the thrust.

The new system also enables the engineers to check and calibrate the jet plane's own thrust-measuring instruments.



Colors to process or nymrogenium groun to gasonine are unitimed in plant model (apply).



U.S. Starts Making Gasoline From Coal

Missouri plant turns out 200 to 300 barrels a day by squeezing hydrogen into coal under terrific pressure.

AT LONG last the United States has begun tapping its vast coal resources for synthetic gasoline.

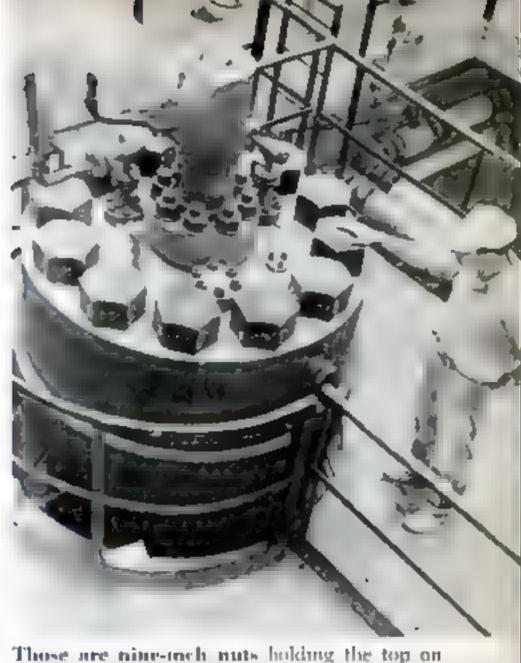
From 200 to 300 barrels of gasoline are being produced daily at a demonstration plant built and operated by the U.S. Bureau of Mines. It wrings gasoline from coal by an improvement on a German process.

The implication is plain: if the nation's oil were suddenly to be exhausted tomorrow, our internal combustion engines need not want for fuel. A supply would come as fast as coal-processing plants could be built. Our coal reserves are almost incredibly big—coal occurs in 30 of the 48 states. We probably would supplement coal gaso-line with oil-shale gasoline (PS, Feb. '49, p. 130).

The coal gasoline now being made in Louisiana, Mo., is a pittance compared to the daily U.S consumption. Yet it is the first we have produced in quantity.

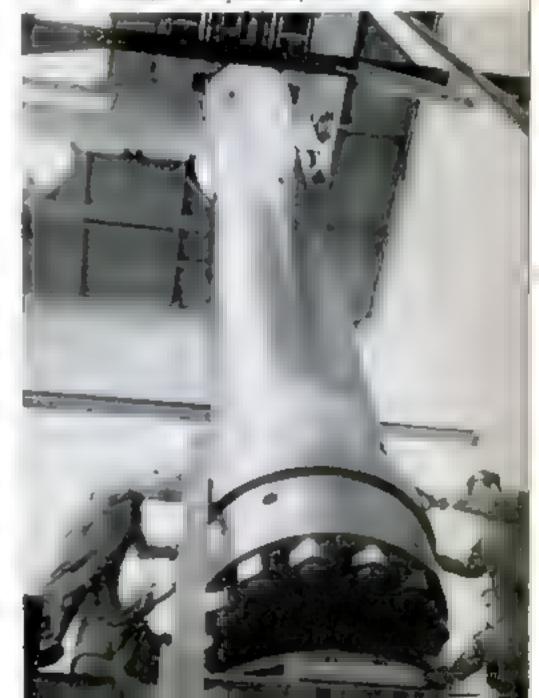
The gas is of good quality. In octane (anti-knock) rating it can be made to equal the motor and Ethyl@-containing grades that you can buy currently at the corner filling station.

The cost? Well, today's oil-refinery price for gas is 10 to 12 cents a gallon. That includes profit and other business items.



Those are nine-meh nuts holding the top on one of the liquid-phase converters at the Louisiana Mo., synthetic plant. The grant nuts are needed because of the tremendous pressure inside the converter—10,300 lb. per sq. in

Concrete safety shielding can be seen in this view of a parter from below Inside the heavy still view I, paste-made by crushing coal and mixing it with oil and calidyst as I reed to absorb ladregen by pressure, 930. It heat



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Construction of converter, in which coal is unde into petroleumlike hydrocarbon by addition of hydrogen atoms, is shown in cutaway above. The coal paste, entering at bottom, passes through two such tanks, leaving as a liquid. Another similar tank handles it as a vapor, adding more hydrogen, before gasoline is obtained.

Gas made in the demonstration plant costs from 8 to 15 cents a gallon, without profit or business expenses depending on the price and properties of the coal. Large-scale production might cut that.

There are two ways to get gasoline from coal. Either provides other products too. heavy oils, Diesel oil, jet fuels, and so on. Germany developed both processes. One, the Fischer-Tropsch, uses carbon monoxide, the same odorless and lethal stuff that streams out auto exhausts, and hydrogen.

The other is the Bergius process, the hydrogenation of raw coal. It makes coal accept additional hydrogen until it is like

petroleum hydrocarbons,

The principal difference between petroleum and coal is molecular structure and hydrogen content. The experts' problem is that of making coal (impure carbon containing some hydrogen) take more hydrogen and, breaking down, become in part a synthetic hydrocarbon. Petroleum is a natural hydrocarbon. So are natural gas, paraffin, India-rubber, turpentine, certain essential oils, and some coal distillation products.

To Try Other Process

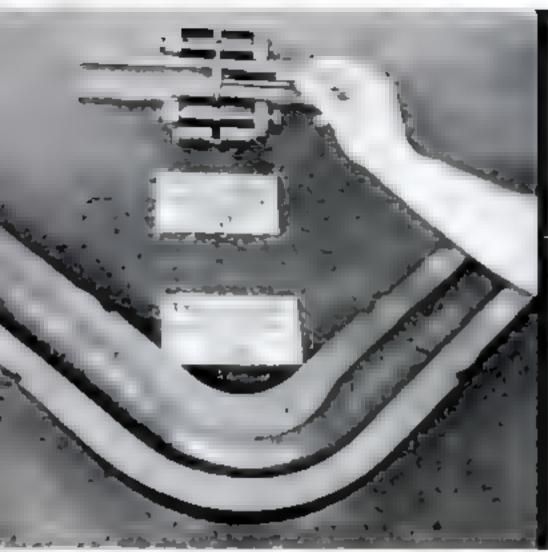
To make gasoline from coal, the laboratory people want first to produce something consisting of one part carbon, and two parts hydrogen—as chemists say, C_nH_{4n} . The "n" here merely stands for a quantity. The important point is the relative amounts of the elements present. This C_nH_{2n} can, like crude oil, be distilled to give gasoline and other things.

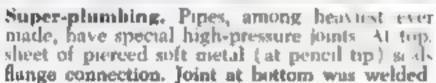
The plant now operating in Missouri hydrogenates coal. The Bureau of Mines pretty soon will also have a Fischer-Tropsch

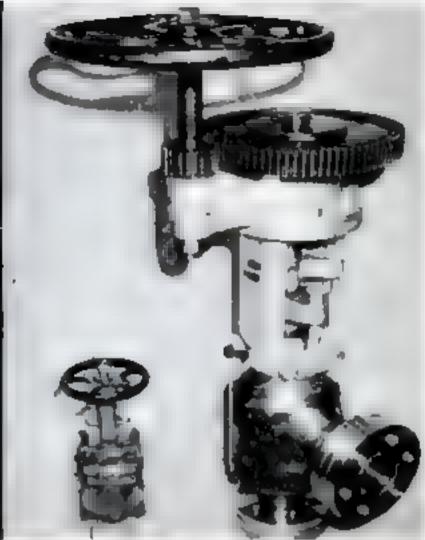
plant finished at the same site.

The bloodstream of the hydrogenation process for making gasoline is hydrogen. At the operating pressure of 10,000 pounds per square inch, three fourths of the pressure is exterted by hydrogen. Besides pressurizing and adding itself to coal, it sets temperature in the reaction vessels.

Hvdrogen isn't made for free, and so it is captured here and there in the system after it has done its work, and then recycled. Since it can be highly explosive—especially under pressure—all manner of safety precautions are taken. The system is "closed," There are no holes except openings that let raw materials in and spigots that let intermediate and finished products out. There are steam snuffing lines everywhere.







It's not easy to turn off 10.300 lb, per sq. in. Compare the standard two-mah valve at left with the general grant at right also a two-maker used in coal-hydrogenation process.

The synthetic gasoline produced is near 78 octane—a premium grade without tetraethyl lead. It can be further improved by slight changes in the process or by the addition of small quantities of tetra-ethyl-lead. Dr. L. Hirst, chief of the plant, doesn't know how much lead his gas will pick up. He hasn't tried adding it.

It takes about a ton of coal to make a little over two barrels of gasoline (85 gallons) or 2% barrels of Diesel oil

The plant has been using a Wyoming soft coal, but probably will reach into nearby Illinois for future supplies. The Wyoming coal was chosen for initial work because reserves there are huge, Wyoming coal interests were anxious to see what could be done with their product, and it produced little ash or contaminating sulfur.

Making coal gasoline posed some new problems for American industry. Only after several cut-and-try attempts were pumps manufactured that could stand up under the punishment meted out by the mixture of oil and powdered coal. The secret lav in making plungers and valves very hard. That reduces abrasion to a minimum

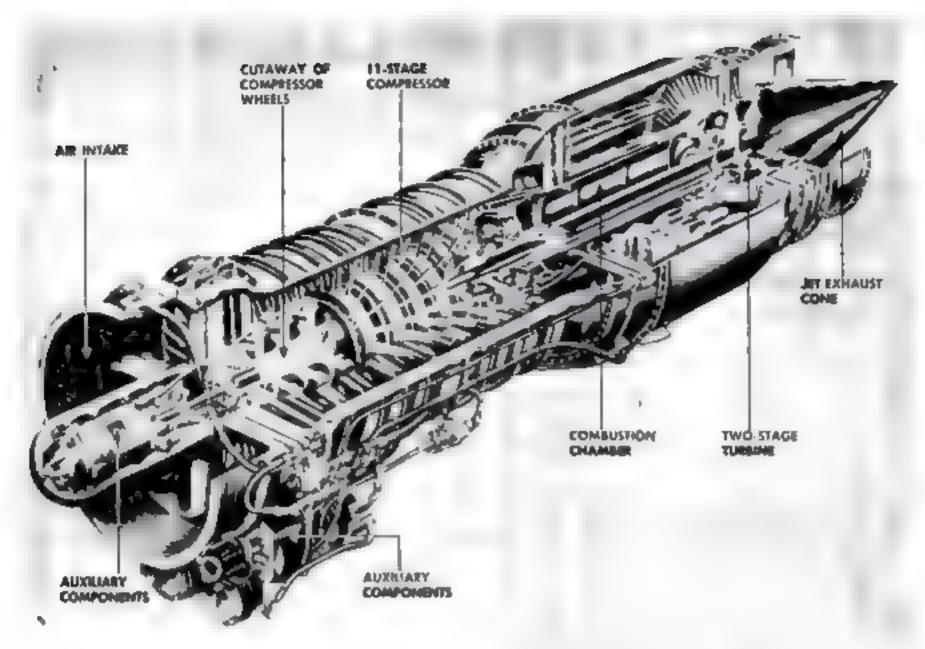
Two marked departures from the German method have been made. The German plants had several hand-operated controls. The human factor makes them dangerous. Our controls are almost wholly automatic.

The Bureau also felt that the Germans' convection method of preheating the coal paste would be too expensive. The U.S. method uses a direct natural-gas-fired heater and protects the paste-carrying tubes with a superheated steam jacket.

While the U.S. has made strides in hydrogenating coal, we certainly didn't do it alone. Seven German experts are right here in Missouri helping with the plant design. One was the assistant director of high-pressure research in synthetic fuels before Germany fell. Two were plant managers.

The new coal gasoline works all right. It has been used in official cars around the plant, and will be sold to other government departments. Although none is to be sold to the public, the other day a stranded taxpayer on the highway nearby got a pint or so. He must have known he was burning some weird concoction. For like all untreated gasolines, coal gasoline smells like fury,

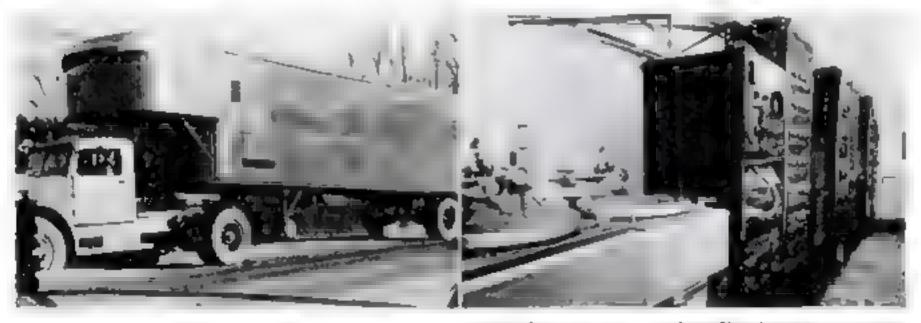
It won't be hard to get rid of the smell. The real question is: can we depend on coal to supply all the gasoline and oils we need? Or must we find new ways to fuel our civilization? The plants at Louisiana should give the answer.



5,000-Hp. Jet Unveiled

THE veil of secrecy shrouding one of the hottest U. S. jet engines, the Westinghouse J-34, has been lowered enough to give you this inside peek. The 10-foot-long unit produces more than two and a half pounds of thrust for each of its 1,200 pounds of engine weight—equivalent to 5,000 hp. at

high jet speeds. A pair of J-34s powers the Navy's McDonnell Banshee shipboard fighter and the Air Force's new Lockheed F-90 penetration fighter. Standing still, the engine sucks in air at 250 m.p.h. and spews it out of the nozzle at the rear at 1,200 m.p.h. The compressor blades whirl 12,500 times a minute to pack in the 100 tons of air the engine "breathes" an hour.



Missiles Get Mobile "Ears"

NAVY scientists won't miss any of the vitally important data being radioed down from sky-searching rockets. Their latest telemetering system has its receivers set up in a trailer that can be moved wherever reception is best. The trailer (left) contains two

complete stations to handle the 60 messages at once sent from the research rockets. The picture at right shows the interior, including the telemeter receiver panels and two turntables for disk recording. Built by Johns Hopkins, the unit—which also includes heating and air-conditioning equipment—fills the specially adapted trailer.

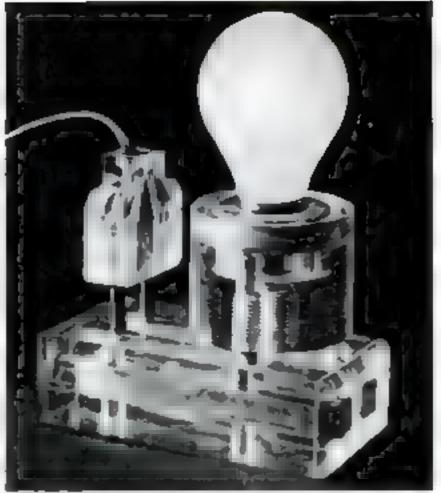
New Plastics Conduct Current

PLASTICS, widely used as electrical insulators, now offer promise of filling new jobs in the electric and electronic fields. A new class of plastic materials under development by Markite Company, New York City, and Naval Ordnance Laboratory, makes it possible to mold plastic forms exhibiting a wide range of conductivities.

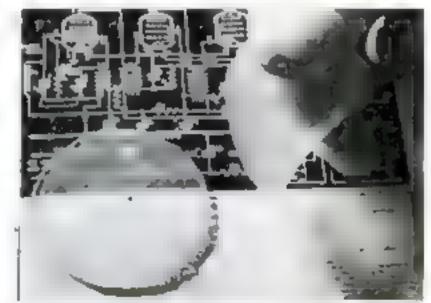
Like ordinary insulating plastics, these Markites® can easily be molded, machined, pressed, or formed into practically any shape. This is of special value in mass-producing intricate conducting parts, such as some three-dimensional circuit elements.

'An important feature of the Markites is that they possess the general mechanical properties of ordinary insulating plastics. Because they expand and contract with heat at about the same rate as certain insulators, they can be molded together with the insulating materials in fluid-tight structures. Since the expansion rates are the same, there is little danger of the "co-molded" segments coming apart under the stress of friction, heat, or cold. Markites have been made with unit resistances as low as that of mercury.

But don't expect to buy lamp cords that are plastic through and through—Markites cost too much, are still limited to special applications warranting the expense.



There's no metal in this lamp except in bulb and cord. Internal connections are all Markite®.



Conducting plastics can be made nearly transparent, and flexible enough to be bent double.



Conductor and insulator—both plastic—can now be molded together. All-plastic commutator (upper left) has integral conducting segments instead of metal inserts. It can't come apart under friction heat. Other pieces include threaded resistor, than rod, part for "bridge."



Electroplating, important in many electrical applications is much easier with conducting plastics. Unlike ordinary plastics, which must be coated with metal before plating, Markite samples above were plated directly. The bond between plating and plastic is also stronger.



New Crosley Roadster

CROSLEY'S new, underslung roadster is designed to lead a double life. Strip off the windshield, headlamps, bumpers, top, and spare wheel—and you've got a racer.

Christened the Hotshot[®] and priced at less than \$1,000, the roadster-racer represents Crosley's answer to the small sports

cars coming from Europe.

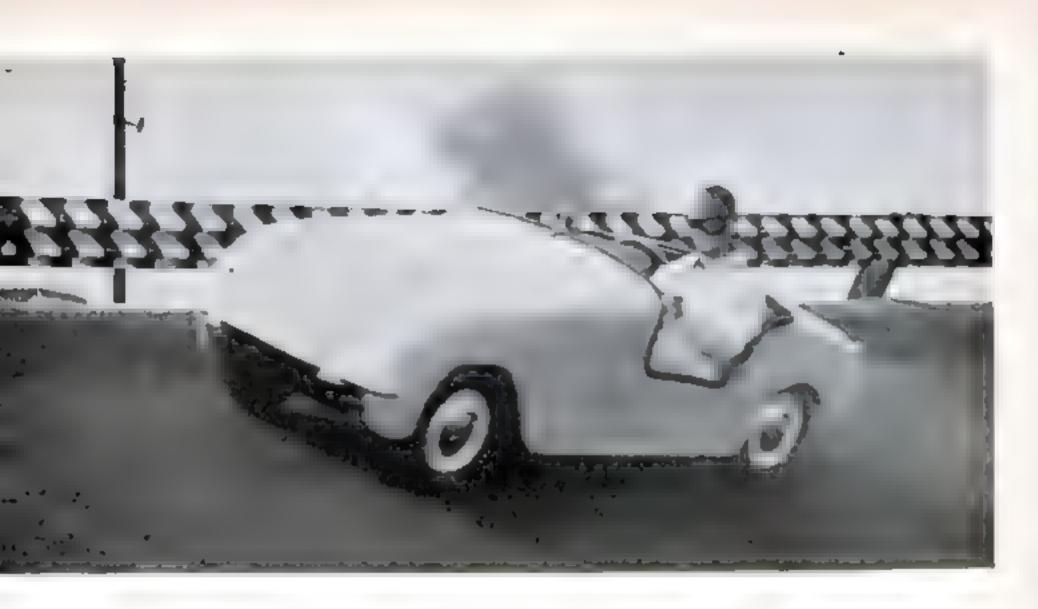
Brightly painted and sporty in appearance, it breaks with Crosley tradition in several ways. A new frame, sweeping down at the middle and up at both ends, puts the driver and passenger close to the ground and gives the car a long, low silhouette. The wheelbase is 85 inches, five inches longer than other Crosley models. The over-all length is 137 inches, the width 51.

At its rear wheels, the Hotshot introduces a novel method of suspension. Coil springs bear most of the load, but working in conjunction with each coil is one leaf of the quarter-elliptic springs that previously did the entire job. Semi-elliptics are retained at the front. New larger hydraulic shock absorbers are used at all wheels

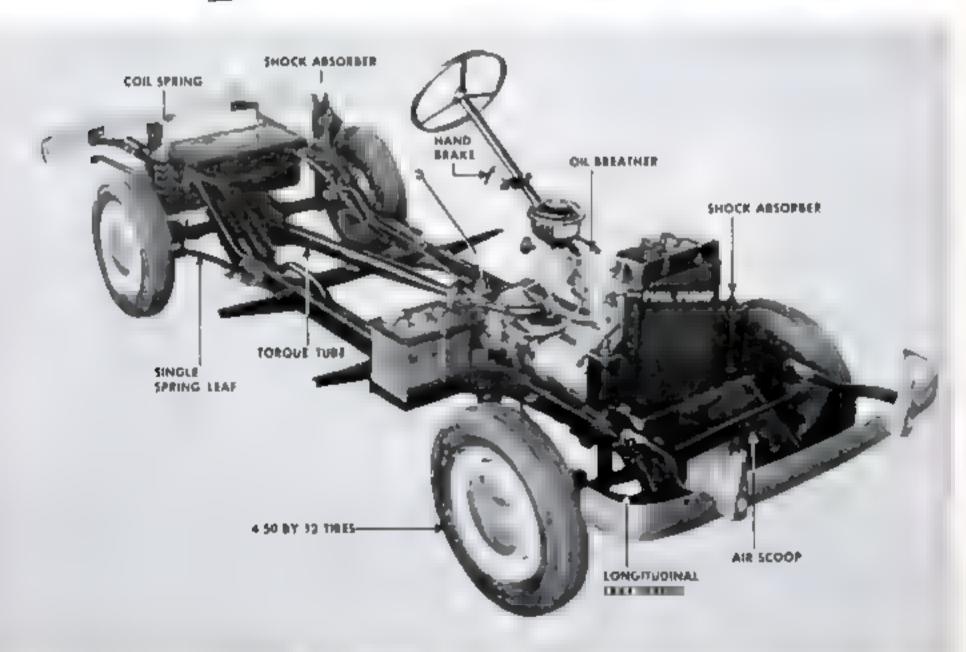
Crosley's recently developed 26.5-hp. Ciba® engine powers the Hotshot. This engine has a cast-iron block instead of the brazed assembly of the old Cobra®.



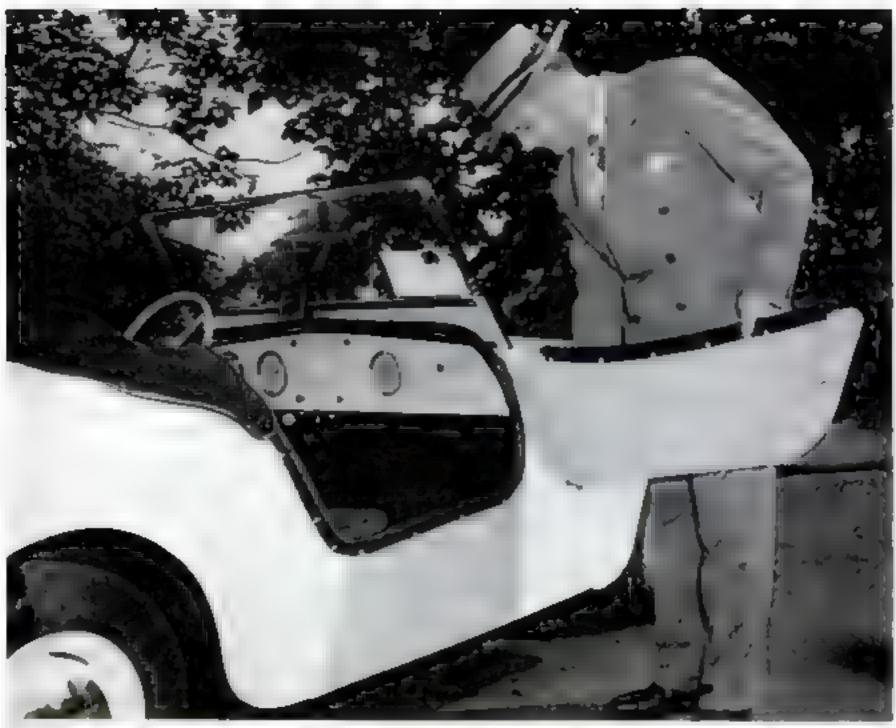
Removable panel gives access to engine. Hood sweeps gradually down to the bumper line. In place of a grille, the car has an air scoop, under the bumper, to feed air through radiator



Strips Down to Racer

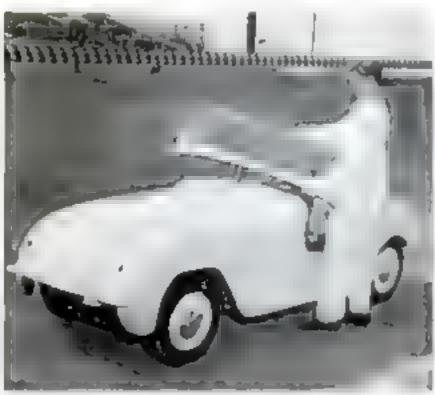


Cradle frame gives a reac-higging albouette and a lower center of gravity. Rear suspension is unconventional—a coil combined with one leaf of quarter-elliptic spring. Besides bearing a fraction of the load, this leaf also functions as a torque rod. Strut-type shocks provide damping at all wheels. The engage has been moved behind the sleek car's front axie.



Shallow doors book on, a fabric top pulls into place (see lower right), and curtains enclose cockpit when need arises. Rubber molding on edges of cockpit gives you protection against

bumps. The leather-covered seats pivot forward for access to luggage area behind. Like other recent Crosley models, roadster is fitted with hydraulic disk brakes (PS, Aug. '49, p. 169).



Stripped for racing, the roadster scales about 104 lb. less than its usual 1,095, Stripping can be done in a few minutes. To make the job caster, wires to lights are fitted with plugs and mating sockets. Powered by Crosley's high-compression, overhead-camshaft engine, the Hotshot® is said to promise good racing performance. It has done upward of 80 m.p.h.



You sit low, only 16 inches above the pavement level, but there's comfortable leg room uside for a six-footer. In over-all length and width, the roadster is about the same as conventional Crosley models, but its wheelbase (85 inches) is five inches longer. The road clearance is eight inches. A removable steel frame supports the top. Battens strengthen the curtains.



"Tan" Meter Times Sunbaths

You can sun-broil yourself to just the right shade tan with a sun-tan meter developed by Hoyt S. Scott, GE engineer.

The model above, for big indoor solana, projects on a screen the image of a dial (inset) that tells how long you must sunbathe for one "minimum perceptible erythema"—a faint pink sunburn. It uses photocells, like those in photographic exposure meters, plus a complex set of filters and a fluorescent screen to limit measurements to the "colors" causing tanning.



Henring Aid Sticks to Head

ADMESIVE like that on cellulose tape holds this Acousticon⁶ hearing aid in place. Eliminating the pressure headband formerly used, the new device is less conspicuous and more comfortable to wear. The small button transmits sound by conduction through the skin and bones of the skull.



Tower Lifts Worker to Ceiling

A PORTABLE elevator raises workmen high enough to clean light fixtures on a 23-foot ceiling, yet telescopes down low enough to pass through a narrow, seven-foot door. The Hydro-Lift[®], made by Safway Steel Products, Milwaukee, is raised by a hydraulic pump operated manually from the platform. A toggle releases pressure for lowering.



Rays Dry Hands, Kill Germs

You still have to wash your hands yourself, but they may be dried automatically when placed under the Electronic Towel⁰. A photoelectric cell starts off infrared units to heat the hands, a powerful hot-air blower, an ultraviolet-ray lamp to kill germs and a counter to record the towel's use.





The real XF-90. It is powered by two J-34 axial-flow jet engines.

Building a drop test model for recorded flight is no job for homeworkshoppers. In tental and its the disassembled skeleton of metal parts, including dural mann essembly and lead weights. After assembly skeleton is covered with plastic skin. Finished model weights half ton

Sonic Models Predict Tricks of Latest Jet

By Andrew R. Boone

WHEN Tony LeVier, Lockheed's chief test pilot, whipped the XF-90 through its first flight recently, he wasn't much surprised by its tricks. Six miniature replicas of the Air Force's new needle-nosed jet had already told him what to expect.

No balsa-and-glue toy, each of these models was precision-made of steel and plastic, weighed about half a ton, cost \$15,-000—and smashed into junk after its one and only flight. Yet the money and effort were well spent, for the model fighters carried equipment that telemetered reports on stability and aerodynamic characteristics to the ground as they screamed earthward

faster than sound from the belly of an F-38 seven miles above Muroc Base, Calif.

The model drops were only part of the comprehensive testing that today's high-performance planes go through before their first flight. Some \$600,000 was spent on wind-tunnel-testing the XF-90, not including the extensive spin-tunnel sessions.

The models depended on gravity and streamlining to fall at supersonic speeds. Strain gauges told Lockheed engineers exactly what forces were exerted on the swept back tail group, and other recordings indicated response to the controls.

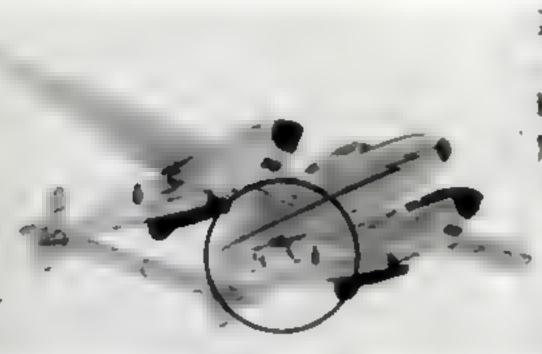
\$15,000 models that fly only once are cheap insurance—the XF 90 now undergoing flight trials cost several million.



Technician is assembling the autopilot that goes into the nose of the model. In the fore-ground are various units of the eight telemetering channels that transmit performance.



Here the 910-lb., plastic-skin model is being attached underneath the fusching of an F-38 Model rides upside down until it is released Special bomb shackle holds it brinly in place.



Sunggled against the belly of an F-38 wartime lighter the NF-90 model waits drop signal. It is released at 35.000 feet, and falls in a path set by a combination time-pressure switch



Plowing into the desert floor at a speed over 750 in his an hoor the mode digs quite a hore, as shown here. The crater is some ed, although parts have little value except as souveners



Before each drop, the F-38 flies low over the ground station to test range measuring radar radio and teaemetering equipment and high-

speed cameris. In center is the telemetering ground station. Man behind the radar disk on top of trailer is operating a movie camera.



Model of future United Nations headquarters (left) shows tall, slender Secretariat Building as it will appear when completed next year.

Put Up a New Skyscraper

PS photos by W. W. Morris

WHIRRING like cicadas on a hot summer's day, with amplified metallic voices, riveting hammers are assembling more than 13,000 tons of steel for the framework of the United Nations' 42-story Secretariat Building in New York City. Familiar to steel men but ever new to spectators, the drama of flinging a tower at the sky is caught by the camera of a Popular Science photographer on these pages. Four of New York's leading construction companies, under the combined name of Fuller-Turner-Walsh-Slattery, Inc., have joined forces to build the future world capital.



1 Spectator on ground sees girder hoisted by crane from delivery truck to top of framework. Camera's eye takes you aloft, in succeeding pictures, to follow steel men's work.

2 Briefly laid down at the top, girder now us picked up again by crane to be set in place. This one is a vertical member, for one of the outside columns of the building's framework,



"Bellman," atop rising structure directs crane bru and up a girder. He gives signals to crane engineer, operating winches it bottom of halding, by planing two cords that sound gings

Crane engineer, facing goings, operates load and focus wincles. Large going is for load small crac for booms. Signals, one stroke to raise, one to stop, two to lewer, one to stop.



3 Maneuvering the heavy girder takes perfect teamwork. Men steady dangling load as bellican, left guides crane with cords running over pulleys at right and down to signal goings.

4 New section of column comes to rest in exact abgument with one below it Bolts will like it in place temporaria. Later, just will be made permanent by riveters



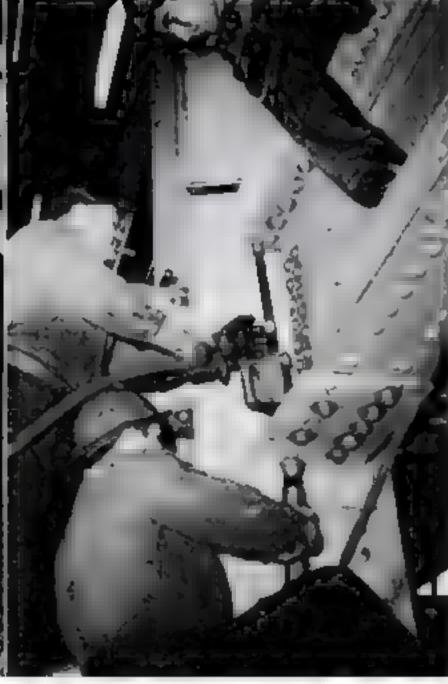
5 Time-honored procedure of riveters makes fascinating spectacle to watch. Perched on high platform, this worker heats rivets white-hot in stove faimed with air by hand crank,



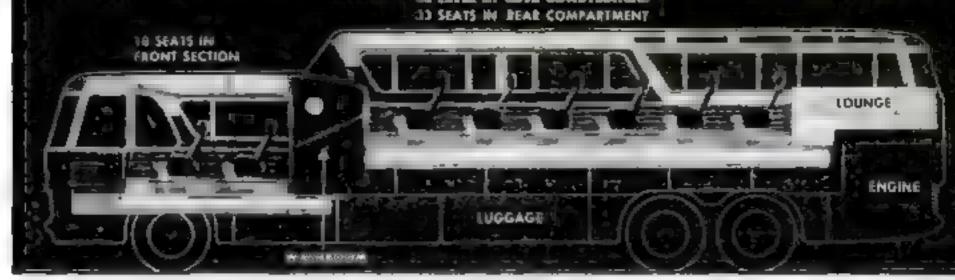
6 Catch! Seizing incandescent, rivet with tongs, man at stove deftly pitches it to riveting crew. Flying rivet, caught in mid-air by camera, is white streak just to left of tongs.



7 Amazingly adept, ratcher, balancing on beam, almost never misses. Plunk' goes rivet, still seen in air, into his funnel-shaped bucket. Tongs in his hand transfer it to rivet hole.



8 Paeumatic tool braces rivet head while air hammer, below forms hot metal of blank end into similar rounded head. Largely pre-riveted, girders need little at-site riveting.



New Bus Lets Riders Sec Sights

Driver's-seat vision for all 43 passengers is the goal of this Scenicruiser® bus now under test by Greyhound. The raised rear compartment is fitted with a curved windshield and safety-glass roof panels, glare-proofed for sunny weather. At extreme rear,

an eight-seat, semicircular lounge section faces observation windows that curve clear across the bus. Three steps lead down to the front section. The bus is air-conditioned, has a public-address system, hydraulic-powered steering mechanism, and toilet and washroom facilities. It is 40 feet long, compared to 35 feet for most conventional buses.

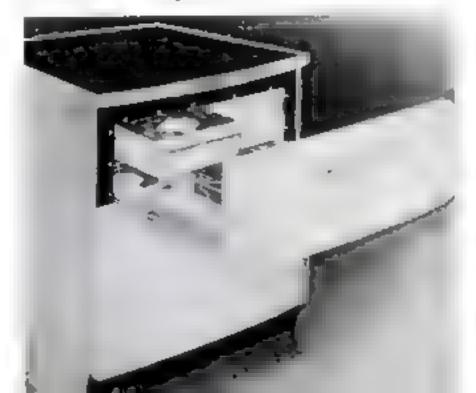
Magnet to Curve Cosmic Rays

SEVENTY tons of carefully forged and machined steel form the core of a giant magnet (right) that puclear scientists will use to bend cosmic rays. The magnet is part of a new pressurized cloud chamber being built at Brookhaven National Laboratory to learn more about the mysterious, powerful rays from outer space. The magnet core was forged by the Bethlehem Steel Co. It will support 10 tons of copper coils through which four Diesel-driven generators will feed 12,000 amperes of electric current to produce a potent magnetic field.



You needn't dig for items in the back of this new True-Zone[®] refrigerator. Instead of a door, it has drawers like a filing cabinet.

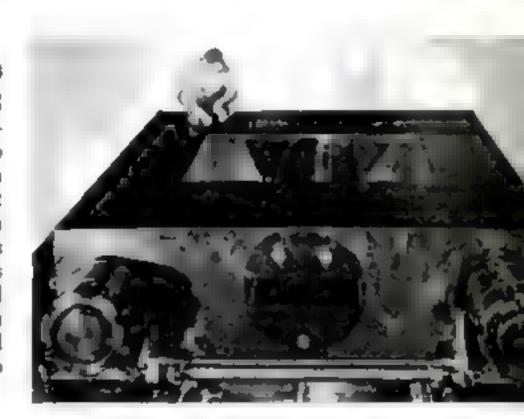
The flat Formica® top, 36 in. high, adds kitchen work space. Drawers have rustproof slides and nylon rollers that need no oiling. The deep bottom drawer holds tall bottles. Acme National Refrigeration Co., Brooklyn, makes the refrigerator.



Combine Cools Driver

When the mercury soared over 90 in his Kansas wheatfield, farmer John Blackwell added a new attachment to his combine—a cooling blower fan. Shown below, it shoots fresh air down through a hole in an improvised roof onto the operator. A belt connected to the combine's elevator sprocket drives the fan. Though the air itself is hot, the blast cools by causing evaporation.





New Generator Hurls Life-Size Lightning

Engineers wield man-made thunderboits in ame-inspiring tests of electric devices.

By Alden P. Armagnac

PS photos on location by W. W. Morris, pages 130, 131, 132, 135.

IF LIGHTNING struck within a few feet of you, and you were lucky enough to stay alive, what would it look and sound like?

Standing behind protective wire grating in a hangarlike building at Pittsfield, Mass., you can safely learn the answers. You see a narrow streak of yellow-white light so brilliant that its branching pattern impresses itself on the retina of your eye—and is still visible, with your eyes shut, for some little time. Simultaneously you hear a crash like a big gun firing, but, surprisingly, not too loud for unprotected eardrums to stand.

In this building, General Electric engineers have just placed in operation the mightiest artificial-lightning generator ever built. For the first time it enables them to duplicate the "business end"—the part that strikes buildings, trees, and power lines—of natural lightning bolts up to well-above-average power and destructiveness.

Their new "life-size lightning" machine hurls an awe-inspiring thunderbolt of 15,000,000 volts for a record distance of 50 feet through the air. For the few millionths of a second that the giant spark lasts, the generator delivers a 33,000-ampere flow of current. It would take a conductor of solid copper at least seven inches in diameter to carry so many amperes continuously.

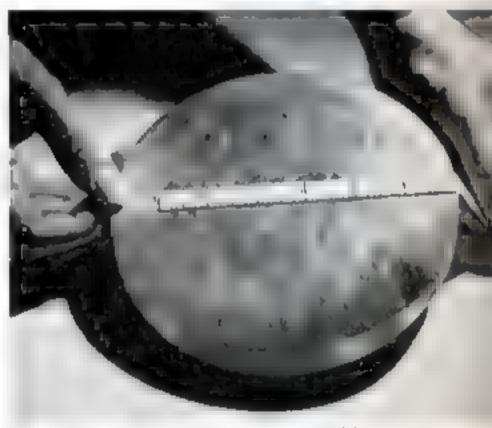
Compared with the largest previous artificial-lightning generator, the one whose 30-foot arc of 10,000,000 volts thrilled New York World's Fair visitors a decade ago, the new one unleashes half again the voltage and nearly twice as many amperes. Momentarily its power exceeds that of all the hydroelectric power stations in the United States combined!

Spectacular pyrotechnics occur when

This is it—real lightning! Fifty-foot bolt of 15,000,000 volts, mightiest ever produced by man, matches natural ones of above-average power. Its thunderclap sounds like big gun.



Thin copper wire, strung in zigzag pattern, canishes in shower of molten sparks as manmade lightning from generator hits it. Sparks fell this far before camera's shutter closed



For split second, new generator yields 33 000impere if w of current—an amount that would need a sclid copper conductor of at least the thickness above to carry it continuously.

When man-made thunderbolt hit block of wood, this fragment (below) was hurled 50 feet. It struck a rack of resistors with such force that one was embedded in it as shown

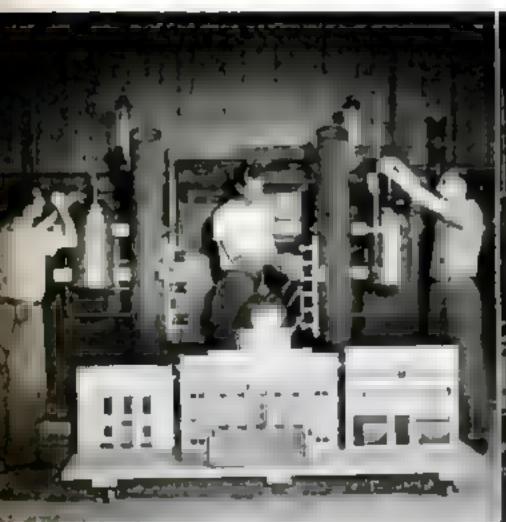




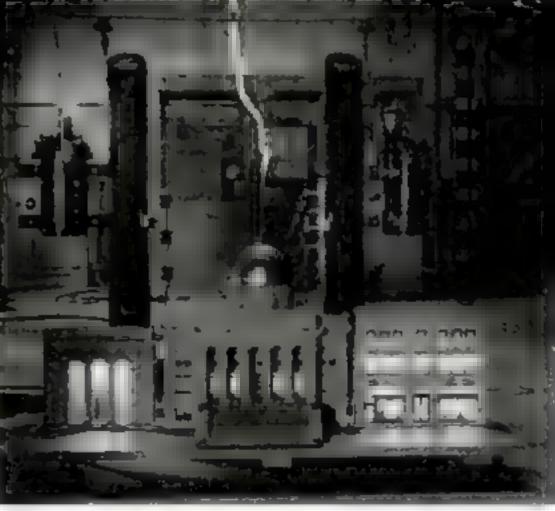
Operator touches off lightning bolt by pressing this butten, after 30-second build-up of the condensers and sounding of warning horn. Eves to osciolograph, he can see wave shape of discharge Prefective wire grating shields his control booth from runaway flash



Are of lightning generator flashes over string of 30 insulators to measure schip's maillating effectiveness. Exemply four in coost used considered builds up voltage until current leaps between top and bottom of string, producing the brilliant display shown above.



Model of city buildings, lit by power from transformers on pole behind it, shows now modern lightning arresters prevent power failure during electrical storm. Above, engineers are installing arresters on transformers. Grounded lightning rod protects buildings themselves.



Bolt strikes transformers without putting out holts burning in model as helding arresters by pass stroke harmlessly to ground his similar test of transformers without irresters lightning blows fuses and lights go out. Generator's control booth is seen in background,



Moved outdoors, one of generator's twin sections hits transmission line with 25-foot bolt of 7,500,000 volts. Flash has been seen and heard two miles away. Portable section of generator rides rail car along track through high door in laboratory wall, seen open in picture.

Inside view of towering section of generator shows metal spheres that act as switches. A fly alighting on one of them alters the geometrically perfect spherical shape on which their delicate adjustment depends, and plagues experimenters by causing a premature discharge.

experimenters "short-circuit" the generator with a thin strand of copper wire and touch a button that releases the lightning bolt. Wham! The wire disappears in a puff of smoke and a fiery shower of molten sparks. That's presumably what happens, engineers suggest, to a radio aerial struck by lightning.

With the new generator, they tried a stunt they have performed with smaller ones—splitting a block of wood into kindling with artificial lightning. This time, a piece of the wood hurtled 50 feet through the air and crashed into a resistor rack, with such force that a resistor was found deeply embedded in it. Repeat performances were forthwith tabooed as too dangerous to spectators and equipment,

In more scientific tests, engineers use the new generator to find out what happens when natural lightning hits transformers, insulators, lightning arresters, and transmission lines.

An are from the generator flames over a string of insulators, suspended high in the air, to measure their insulating effectiveness. And to study what happens to a power line hit by lightning, one of the generator's

twin sections rolls bodily outdoors on a rail car, to bombard a 1%-mile-long experimental transmission line with a flash that has been seen and heard two miles away.

The generator is built in two, 44-foot-tall sections, each made up of black columns ringed with silvery stainless steel. Operating independently, each section builds up 7,500,000 volts, and their combined power gives the generator's 15,000,000-volt total. The black stacks are banks of electrical condensers, storing electricity as do the cumulus clouds or "thunderheads" of electrical storms.

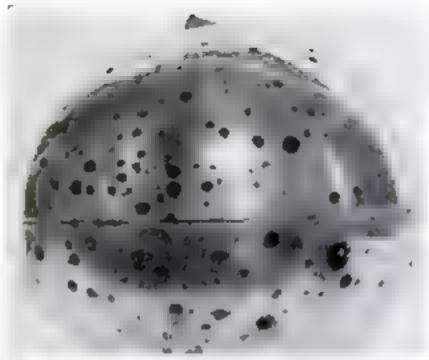
For a 30-second charging period, current at comparatively moderate voltage feeds the condensers, which are connected meanwhile "in parallel"—like appliances you plug into a house circuit. That is, all the condensers get the same charge-building voltage, independently of the others. Then a tricky switching arrangement reconnects the condensers "in series," so that the voltage of the charge stored on each is added together to yield a thunderbolt. Invention of this "Marx circuit" by E. Marx in 1925 led to the first artificial-lightning generator



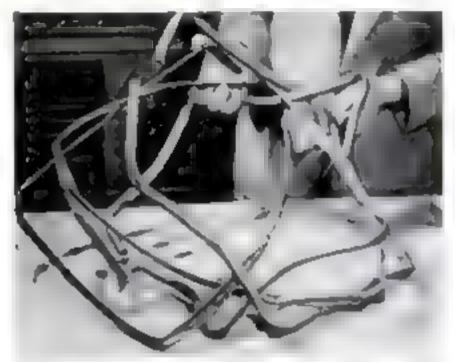
Artificial lightning, bomberding metal sphere exhibited by Julius H. Hagenguth, GE engineer, perforated it like sieve. Measuring current and time required to burn holes like those of sphere in photo at upper right yielded useful data on characteristics of natural lightning.



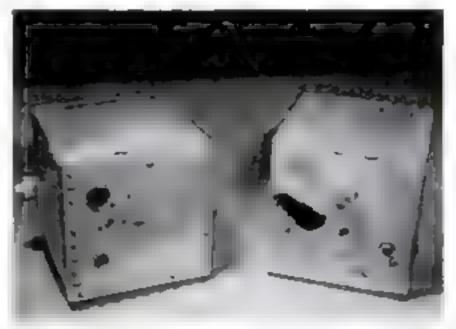
Lightning has hit many planes without harm to passengers or senous damage to craft. Allmetal construction conducts stroke without dangerous sparks. DC-4 transport had only this small hole burned in pitot tube, where lightning hit it, as souvenir of experience.



Lightning strokes hurned 150 holes in ornamental nickel-plated copper sphere atop 878-foot Tennessee radio tower—then prankishly knocked it to earth, revealing their handiwork.



This once was a circular tuning coil in radio station WSM, Nashville, Tenn. Then lightning hit it. Magnetic effects of huge current crumpled coil and flattened copper tubing, as seen. Laboratory tests with copper tubing yielded similar effects at 75,000 to 118,000 amperes.



Artificial-lightning tests on sample gasoline tanks, of 0.051-in. aluminum alloy, indicated that high-voltage spark would be fire hazard if it struck tank directly. Bolts of high-powered man-made lightning punctured sample tanks and ignited their inflammable contents.

of 1,000,000 volts and its successors of in-

creasing power.

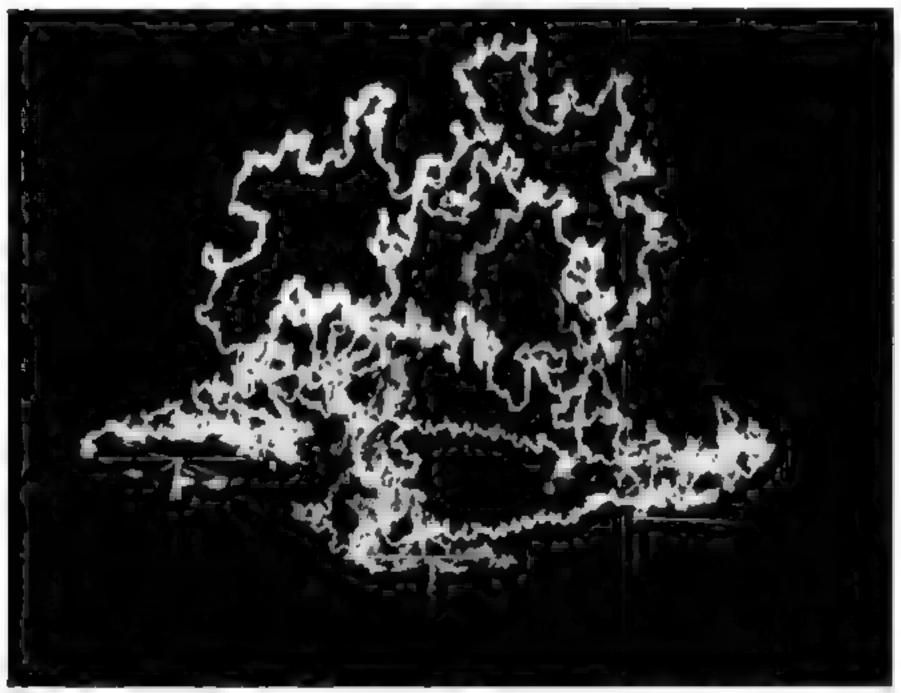
Even the present 15,000,000-volt machine is far from the theoretical limit of voltage attainable by such an "impulse generator," declares Julius H. Hagenguth, engineer in charge of the GE high-voltage laboratory. By increasing the number of condensers, a still more powerful one could be built. Practical limits are the cost of the machine itself, against advantages to be gained, and the size of the huge building required to house it. Increasing voltage calls for more and more clearance from walls, ceiling, and other apparatus to prevent stray bolts. For the 15,000,000-volt machine, this minimum clearance is 33 feet. "High-Voltage Hall," its great windowless test chamber, measures no less than 165 feet long, 95 feet wide, and 85 feet high.

Three 1,000,000-volt, 60-cycle transformers share this enormous room with the black-and-silver towers of the new generator.

Applied to a spark gap, their own discharge aids studies of high-voltage action—and incidentally creates one of the most beautiful of all displays of electrical fireworks, illustrated below.

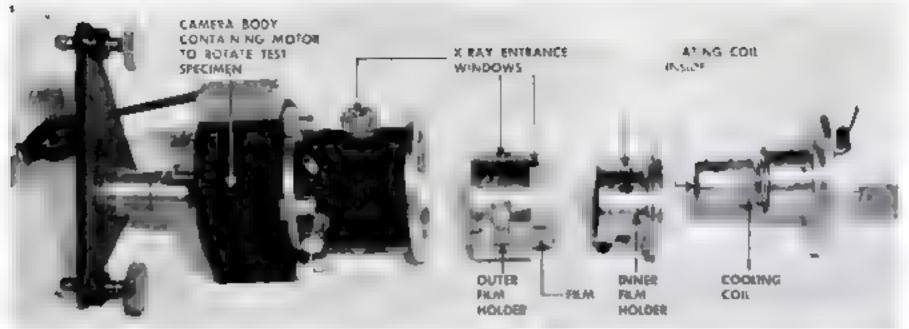
Most impressive of the machines in adjacent rooms of the Pittsfield laboratory is a "high-current" impulse generator. It delivers the staggering current of 260,000 amperes with a respectable thunderelap of its own. While its artificial lightning lacks the voltage to leap great gaps, it will subject small test specimens to more than the record 200,000 amperes ever measured in a natural lightning stroke,

Virtually any of lightning's pranks, of which some are illustrated here, can now be matched by GE engineers with these machines. Using their findings to perfect economical and trouble-proof power-line equipment, they are constantly reducing the "electrical cost of living" for the ultimate consumer,



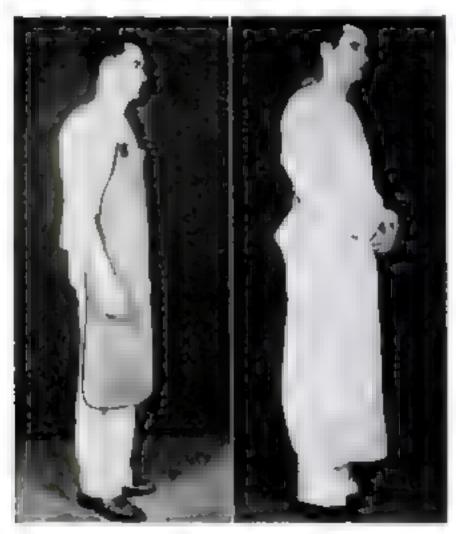
Electric fire of 1,000,000 volts, from threephase 60-cycle transformers, gives spectacular display as it leaps nine-foot gaps between rotating "pinwheel" electrodes. These whirl of own accord as electricity escapes from their backward-turned points. Are is carried 20 feet

high by heated air currents and is colored red, yellow, and green by chemicals tipping the three electrodes. Sound effect of electrical fireworks resembles drone of airplane, punctuated every few seconds by a sharp crack as a new arc is struck between pair of electrodes.



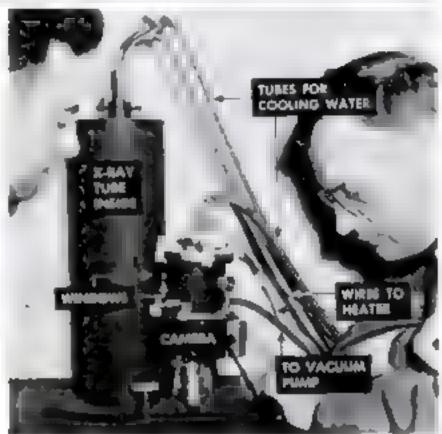
Hot Camera Tests Jet Metals

A NEW instrument shows metallurgists how alloys act at the high temperatures in jet and rocket engines. The device is a camera with a built-in electric furnace—shown disassembled above, and in use with an X-ray generator at right. It takes X-ray shadow pictures of the arrangement of atoms in the heated test specimen. Prof. Arthur A. Burr, of Rensselaer Polytechnic Institute, designed the new research instrument.



Glass Smock Stops Atom Rays

DECONTAMINATION crews in an atomic war might wear glass clothing to shield them against deadly rays. The smock at right above, made of lead-glass fiber, gives better protection than the apron of lead-filled rubber at left—yet weighs only two ounces more. Dr. V. W. Archer, of the University of Virginia, led the research.





Echo Room Helps Stop Noise

IT TAKES a noisy room to learn how to make one that'll be quiet. So Johns-Manville engineers test soundproofing materials in a two-story-high concrete room that creates sustained echoes (started by loud-speaker, top of photo). The reduction in echo time caused by different sound absorbers laid in the floor rates each one.



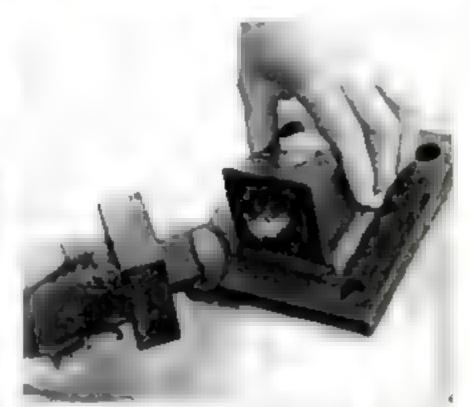
Aluminum-tube framework of the model of a new British "self-supporting" roof. Designers

claim that structures with diameters of between 500 and 600 feet can be built by this method.

Aluminum Roof Strong as Steel

SINCE mathematicians can't figure out exactly how much weight a spherical shell will support before caving in, British engineers tested out such a structure by simply piling bricks on it. As a result, they claim that a new aluminum roof of this design is as strong as a similar steel one.

Designed as a roof for oil or chemical storage tanks, the new structure consists of a criss-crossed framework of aluminum tubing covered with aluminum sheeting. Shown here is the experimental model, 83 feet in diameter with a nine-foot rise, that was brick-tested for strength.



Close-up above shows detail of the ball-andsocket shoes used to support rib ends of aluminum-tube network. Sex men can erect the framework and weld shoes to outer ring in one day.



After framework had been covered with aluminum sheeting, bricks were piled on as shown

above. With a load of 27 pounds per square foot, tests revealed no appreciable strain.

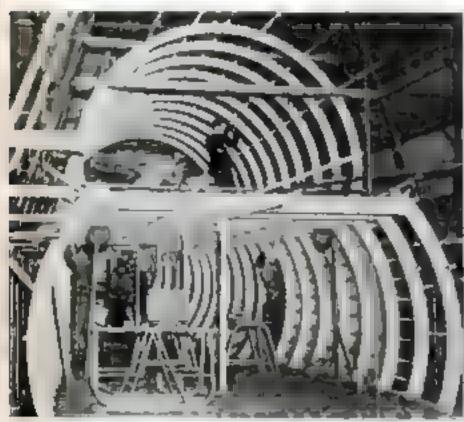


Model of 10-engine, long-range flying boat shows the high wing and single fin and rudder.

BRITAIN'S faith in flying boats and turboprop propulsion is borne out by the huge Saunders-Roe 10 engine Princess¹ now nearing completion at Cowes, Isle of Wight.

Designed for flights across the Atlantic to South America, the 5R/45 will accommodate 85 passengers, plus a crew of 14. The latest in aerial luxury planning, the plane will have quarters with the comfort and privacy of an ocean liner's cabins. Provisions have even been made for a munature nursery complete with toys and sandpit

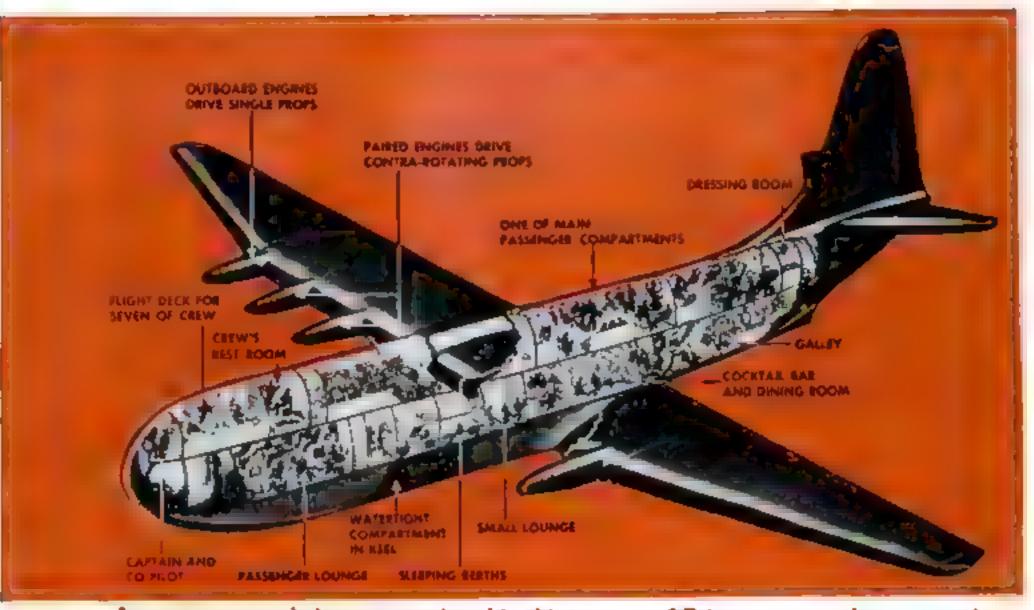
The new flying boat is of double-deck design, similar to that of the U.S. Boeing Stratocruser*. It will be powered by 10 Bristol Proteus* turbine engines, driving 10



Finishing touches are put on skeleton of the double-tubble tesclage. Hull of the flying boat will be 150 feet long wingspread will be 220 feet. Landing Brats will retrict into wings.



This view shows roominess of the pilets' cockpit and the control room. Flight crew of the plane will include five stewards. Plane's decks will be connected by starways fore and aft.

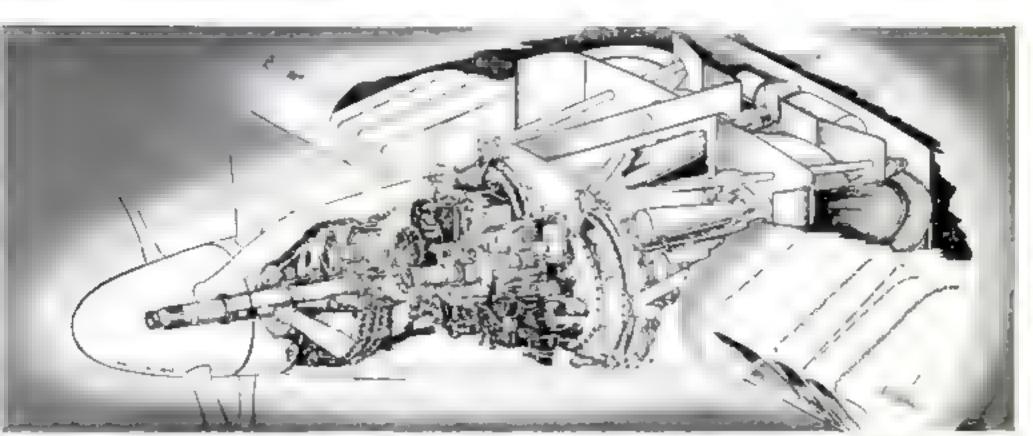


Luxury accommodations are previewed in this cutaway of Princess, now under construction.

propellers, with a total of some 35,000 hp. Eight of the engines are in pairs, each pair driving a pair of contra-rotating propellers; two single engines and props are in outboard positions. The plane will cruise at 380 m.p.h., and will have a still-air range of 5,500 miles. Even at that extreme range, the payload will be between 20,000 and

22,000 pounds. In case of a forced landing, watertight compartments will give buoyancy.

Capable of flying at 40,000 feet, the plane will maintain cabin pressure equal to that at 8,000 feet. Three of the big flying boats are under construction, at a total cost of about \$20,000,000. The first of the Princesses is expected to fly early in 1951.



Sectional drawing above illustrates how two Bristol Proteus turboprop engines are coupled to drive the SR/45's contra-rotating propellers. There will be four of these double engine jobs

in the inner wing positions, with two single engines in outer positions. The 10 engines will develop a total of about 35,000 hp. and give the Princess a cruising speed of 380 m.p.h.



Metals are rustproofed (above), after careful cleaning, for "graphitizing." Standard treatments—varying with metal—are used.



Graphite is applied by spraying, as above, or by dipping. It penetrates surface, as well as providing a film ,0005 in, thick.



Coated parts then are baked for 40 minutes at 400°F. This treatment sets the coating preventing chafing or moisture penetration.



Even after surface film is sandblasted off (white area above), rubbing brings up new film of lubricating graphite (black streak)

Lubricant Baked into Engine Parts

A NEW way to impregnate metals with graphite may prolong the life of your car and other machinery, too,

Graphite, the slippery black form of the element carbon, is most commonly seen as the "lead" in lead pencils. It is also an excellent lubricant, widely used on door hinges and the like. However, it quickly wears away from points of high friction.

Now two chemist-brothers of North Hollywood, Cahf., Ralph and Edwin Hall, have found a way to get around that disadvantage. They force the graphite into the "pores" of metal, plastic, or synthetic-rubber surfaces, so that the supply under the surface will constantly renew a .0005-inch film on the surface, no matter how hard the wear.

The Halls' firm, Electrofilm, Inc., has successfully applied the "graphitizing" process, outlined in photos above, to auto engine parts, gun mechanisms, tools, tractors, electrical apparatus, and other machinery.



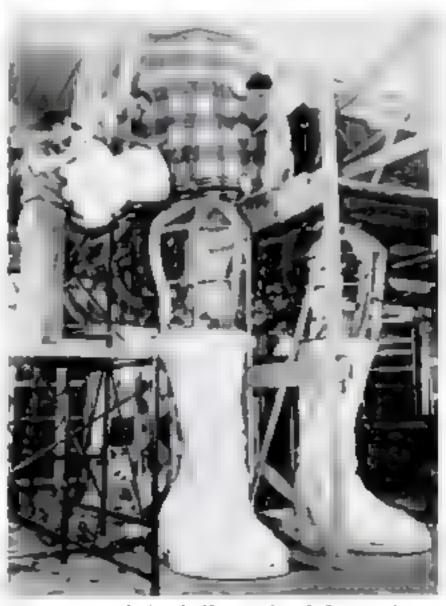
Girl sitting on model's knee gives an idea of its size. The figure talks, rolls its eyes, and moves its head and arms. Buttons are big as pie plates, shirt would make 80 blankets.

Paul Bunyan Comes to Life

Visitors to the 1949 Railroad Fair in Chicago can have a heart-to-heart chat with Paul Bunyan, legendary super-lumber-jack of the North Woods. A complex array of microphones, sound-recorders, speakers, electric motors, and gears enables the giant figure to talk with passers-by and answer their questions. Sitting down, Paul towers 23 feet above the floor. If he stood up he'd stretch 35 feet. He wears size 69 boots, a 42 cap, size 80 shirt, and pants with a 150-inch waist. The Gardner Displays Co. built the gigantic model for the Chicago and Great Northern Railway exhibit.



Paul's moustache gets a final touch-up from artist's brush before the head is hoisted into place. The model's makers call it the largest animated figure anyone has ever built.



This view of the half-completed figure shows the details of its structural-steel skeleton. The feet are 4 feet, 9 inches from toe to heel; boot caulks are big as railroad spikes.

What's New in Ariation FA-356 A356

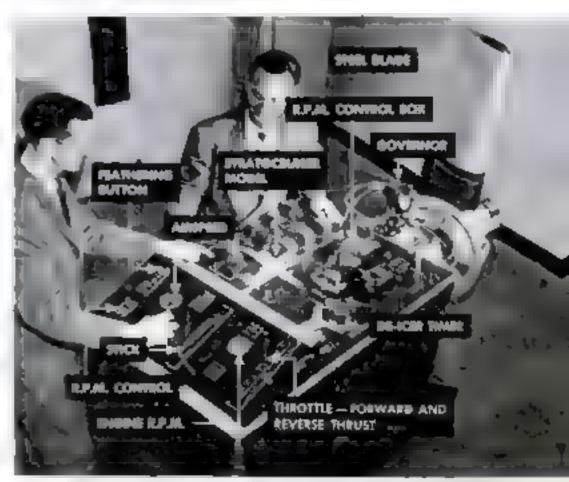
and elongated nose of this version of the famous Lockheed F-80 Shooting Star is packed with radar, enabling it to fiv and fight in pitch darkness and under all weather conditions. Designated the F-94, it is the

Air Force's first jet night fighter, built for high-altitude interception of possible enemy attackers. An afterburner gives emergency boost to the power of the J-33 jet engine. The new plane is flown by a two-man crew—a pilot and a radar operator.

Connie's Humps Test Genr. New electronic devices are being tested in a pair of radomes (arrows) projecting from the top and helly of the Lockheed Constellation? below. Called the POI-W, the plane also has a slightly elongated nose and carries a row of spinelike antennas along the top of the fuselage. Electronic systems proved successful in this experimental Navy project will be produced for use in transport and military types of airplanes.

Hangar-Flying Machine. These engineers are fiving a Stratocrniser® without taking their feet off the ground. The instruments on the panel below simulate operation of the Hydromatic® propeller and control system used on the Boeing plane. Built by Hamilton Standard, the machine lets pilots and mechanics watch the propeller system work as it does in actual flight. The demonstrator can imitate constant-speed operation, reversing, feathering, and de-icing.







ThunderJet's New Schnozzle. Needing a "radar nose" (like the one shown on the F-94 at left) for night and badweather interception, the F-84 Thunderjet also has undergone a face lifting. The job was done by climinating the conventional nose air intake, shown at right, and substituting flush, side inlet duets as shown above. The experimental plane is a result of collaboration by Republic Aviation and National Advisory Committee on Aeronauties.



Big Flaps Aid Jet Flight, jawlike control surfaces on the Northrop Scorpion's wings (below) serve a triple purpose Moved in opposite directions, they become alterons. Opened like jaws, they slow down the aircraft in maneuvering, permitting it to

make steep dives with safety. And when the lower surfaces are depressed simultaneously they slow the F-59 for landings Called 'decelerous," the surfaces also help the Air Force fighter earry a heavier load whole giving it greater maneuverability





High Performance at Low Cost. Twin-tailed and reminiscent of the famous Beech Bonanza[®], this Jupiter[®] is made by the Jamieson Aircraft Co., of Deland, Florida, to sell for \$2,500. A Lycoming 115-hp, engine gives the plane a 150-m.p.h. cruising speed, claim the designers. It is a three-placer, with retractable tricycle landing gear. Other claims are that it will land under 40 m.p.h., take the air in 100 ft.

Fire! Tank Itesists Fire. The 2,000° F flame of a blowtorch doesn't bother the fuel tank at right, installed in the wing of an obsolete plane for demonstration pur poses. The secret is in a flexible coating of American-made rubber combined with other materials that make it fire resistant. The new protective coating was developed by the B. F. Goodrich Co

There's more strength in the molded Fiber-glas® blades shown on the Air Force believopter below. Extreme smoothness and greater rigidity enable the blades to lift more weight per horsepower than many or dinary blades. The 22-foot whirlers were developed by the Cornell Aeronautical Laboratory for the Air Materiel Command



British do Havilland Sea Vampure single-engine, jet naval fighter, with its undercarriage removed, has been used to test carrier landings on a flexible rubber surface that needs no arresting wire. Weight saved by eliminating the landing gear can be used for bombs, guns, rockets, fuel, or ammunition. Launching is by catapult. The plane is powered by a Gobline turbojet of 3,000-lb, thrust.







Jeep Tells "American Story"

The specially built, \$4,500 jeep at right is the first of 65 that will tour the world for the U. S. State Department to help spread the "Voice of America." Power for its movie and radio equipment comes from a 3,000-watt generator. Long cables permit indoor movies to be shown in villages lacking electricity. A short-wave receiver will bring "Voice" broadcasts to remote, radioless areas. The jeep's 80-gallon gas tank and large food and water supply can keep it on the road for long periods.

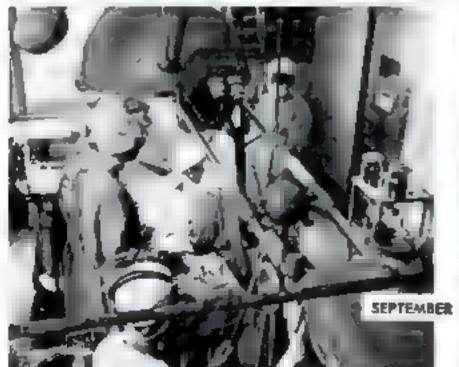


Surgery Televised in Color

Through the television camera pictured here, hundreds of doctors at this year's American Medical Association convention saw full-color close-ups of surgical operations. The telecast, by wire, requires only two TV men in the operating room—one to handle the camera boom and one at a monitor screen to focus the camera and blend the colors.

Steel Fingers Tamp Roadbeds

THE 12 steel fingers on this small handcar take the place of a dozen workmen in tamping ballast under railroad ties. One man operates the hydraulic tampers while another moves the car from tie to tie with a large handwheel geared to the wheels. Now in use on Santa Fe lines, the Jackson Multiple Tamper® can ballast five ties a minute.





Radio Beams Flag Planes

Fastest planes clocked by electronic equipment that can tick off flying time between exactly spaced radio "walls."

By Herbert Johansen

Drawings by Ray Ptoch

STREAKING between two parallel radio beams that flare into space 11 miles apart, Air Force speedsters can now be timed automatically with an accuracy of 1/1,000 of a second. And they can fly as high as 30,000 feet while making their speed runs.

The ballistic cameras previously used for timing (PS, Sept. '47, p. 150) forced planes to make their passes at extremely low altitudes if they were to keep in the picture. Now, with the new all-altitude speed course developed by the Air Materiel Command at Wright-Patterson Air Force Base, Dayton, O., not only is accuracy increased, but the sky's the limit,

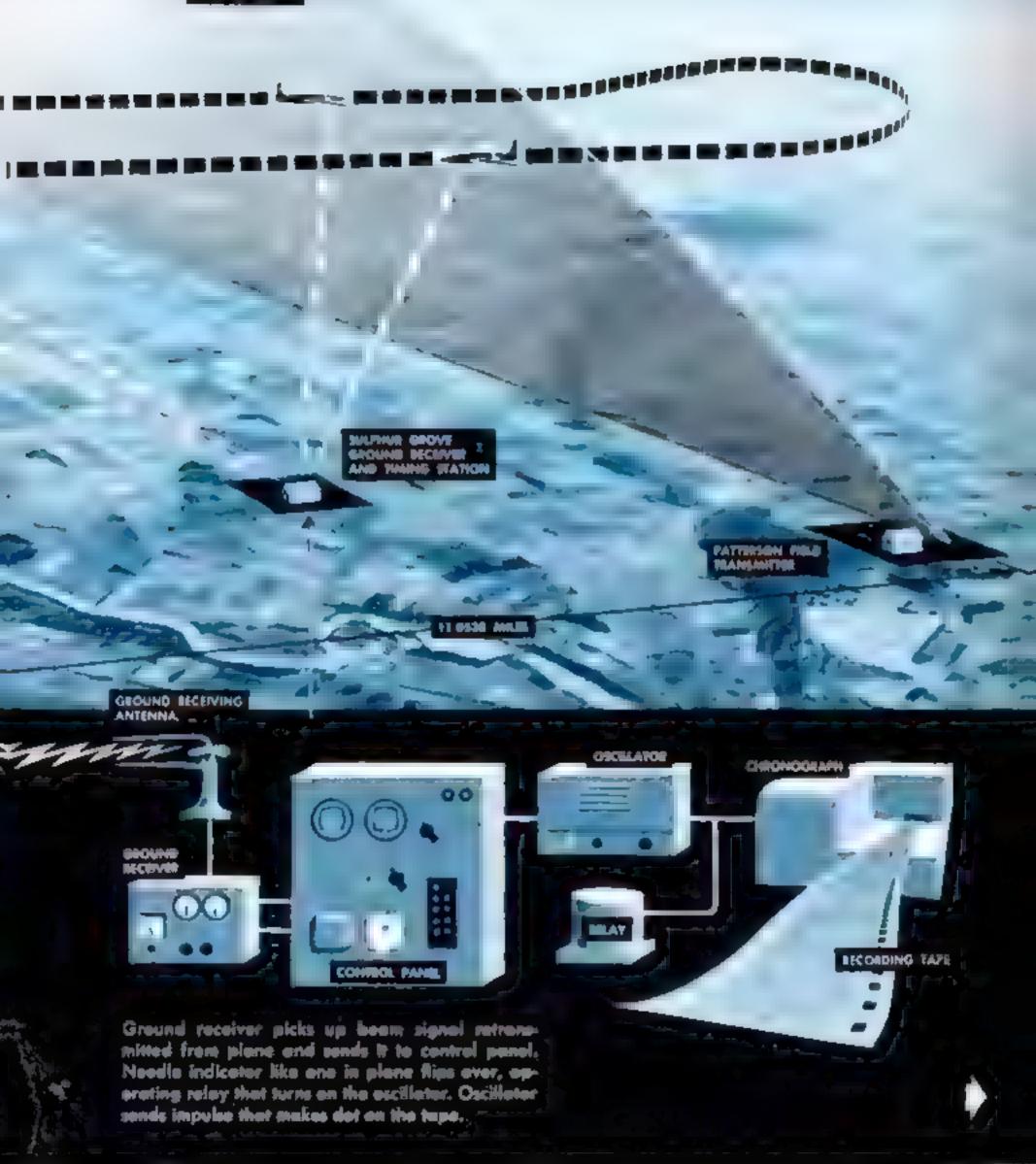
The two vertical radio beams—which act like electronic versions of the start and finish flags used in auto races—are provided by very-high-frequency transmitters on the ground. One is located at Patterson Field and the other at Vandalia, exactly 11.0533 miles apart. The trick is to make these beams like sheets, or walls—very wide vertically yet very narrow (about two degrees) horizontally. This is just the opposite of ordinary broadcasting, in which radio waves are scattered all around horizontally.

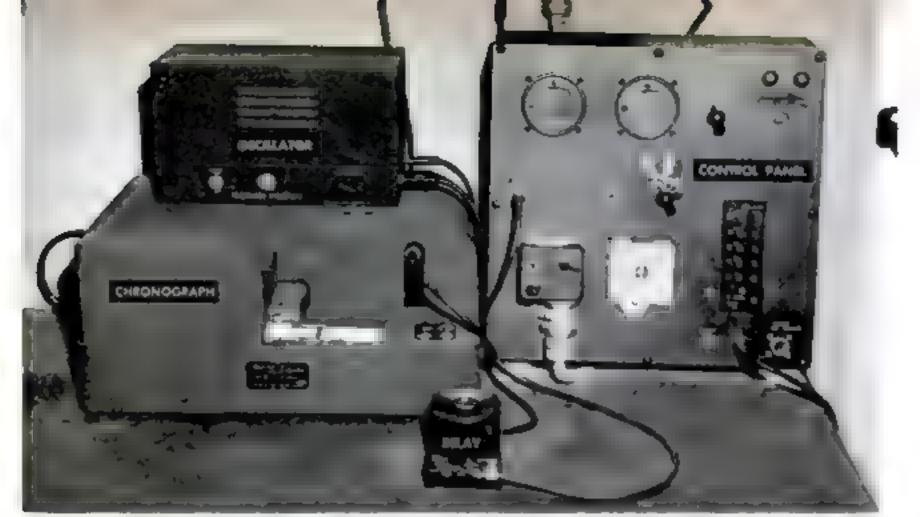
At Sulphur Grove, about halfway between, is a third station. It houses receiving equipment and a chronograph unit that records the actual timing on a moving tape. It also has a transmitter to send out a third beam, providing a shorter course for slower aircraft and a check point for the entire course.

The aircraft also carries special radio receiving and transmitting equipment. The instant the plane passes through a beam, this

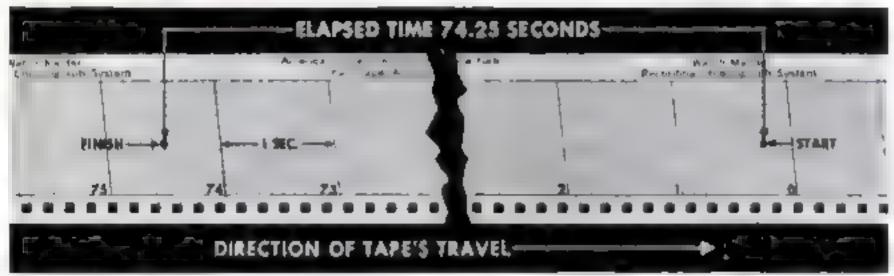
THE EADID BEAM VANDALIA PLANE RECEIVING THANSMITTING VHF RADIO SET As plane crashes through beam, signal picked up by plane's antenna goes to beam receiver, it flips: Indicator needle, telling pilet that he has cressed the beam, and at the same time goes to the control has for retransmission to the ground.

24 EARIG BEAM





Telemetered signal from plane is interpreted on the ground and recorded by equipment above.



Sample of tape shows how start and finish beamcrossings are recorded on tape running through the chronograph. Since elapsed time between beams was 74.25 seconds, and distance is known to be 11.0533 miles, ground speed of plane in this test run was approximately 535 m.p.h.

equipment signals the ground receiving station. The signal truggers the chronograph.

In making a speed run, the pilot calls the ground timing station on voice radio to announce that he is approaching the first beam. The tape is started running through the chron-

Beam-receiver antenna on plane is shown at left below. At right is close-up of antenna pole at Sulphur Grove. Antenna for transmitter is on top, and that for receiver and timer below.



ograph. As he "crashes" through the beam, the beam signal picked up by his receiver flips the needle on an Instrument-Landing-System indicator, telling him that he has crossed the first beam. He then switches to the channel frequency of the second beam. At the same time, the beam signal he has received is automatically retransmitted to the central ground station.

Picked up by the ground receiver, the retransmitted signal causes an oscillator to feed an impulse into the chronograph, marking on the tape the exact instant the beam was crossed. The tape continues to run until the plane crosses the second beam, when a similar chain of events occurs.

While the marked portion of the tape is removed and labeled, the ground personnel stand by for the pilot to announce that he is ready to make a second run. Two passes are made, one in each direction, to compensate for wind velocities.

148 POPULAR SCIENCE



Lets In Sound Without Drafts

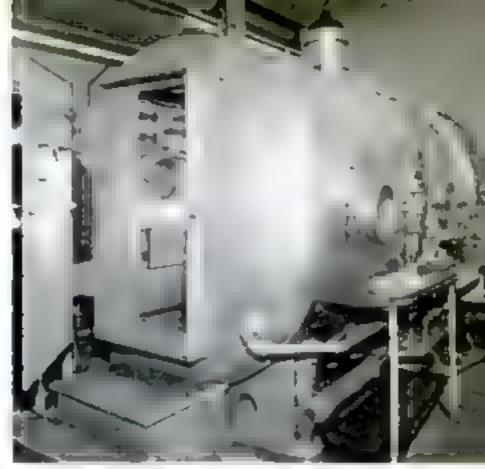
Even have a hard time making yourself heard through a receptionist's glass enclosure? Well, you won't in the Populan Science office. A special frame built into the window (above) lets our receptionist hear a visitor speak in a normal tone, yet prevents drafts and germs from reaching her.

Invented in France by M. Jolfre, the unit consists of cellophane stretched between two plastic plates. Sound passing through holes in the outside plate vibrates the cellophane and is transmitted through holes in the inside plate to the receptionist. The Hygiaphone[®] has also been installed in booths at railroad and subway stations.

Cabinet Top Resists Heat

Even the accidental spilling of hot salad oil (as below) won't mar the new, heat-resistant, plastic work surface used by Frigidaire on kitchen cabinets and electric water heaters, Called Vitalast[®], the grease- and acid-resistant finish is permanently bonded to steel by a special heat and pressure process to prevent buckling, and molded in one piece to eliminate crevices that catch food particles. A wipe with a damp cloth cleans it.





"Flying" Kitchen Tests Cakes

Now they're checking out cakes in this old Air Force high-altitude chamber. Home economists of Pillsbury Mills, Inc., Minneapolis, used it to test prepared cake mixes. A recipe that produces a perfectly baked cake in sealevel New York may give a leaden "failure" in mile-high Denver, for example, because of the change in atmospheric pressure.

To determine the correct recipe for a particular low-pressure community, a cake was baked in the "flying" kitchen, inside which a town's air pressure had been duplicated. During recent experiments, 200 cakes were baked in 64 logged "flights." Technicians in the chamber used a phone to talk to "ground."

Mice Trap Themselves

RESEMBLING a powder box, the container below is really a springless mousetrap. To set it, you raise a pin (barely seen at left) and move the rotating partition against a stop. This opens the door (shown partially open) at the side of the trap. When a mouse tries to remove bait at right, he pushes the partition, closing door. To dispose of eatch, you dunk the trap in water. Albia Products Co., of New York City, is the distributor.



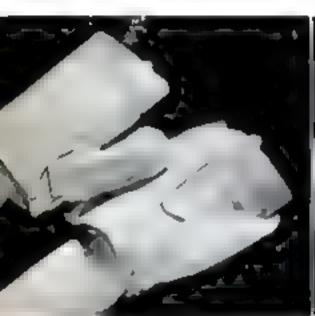
Fitting the Glove to the Job

PS staff photos

THE gloves a well-dressed worker wears these days are a far cry from those white kids your best girl wore at the Junior Prom. Strictly for protection on the job, work gloves can be pretty unusual looking, as shown in this assortment. Made of leather, nylon, asbestos, and rubber, they run the gamut from a woman's firmsy nylon glove — used in the stocking industry to prevent the snagging of hosiery — to a strong, saddle-leather hand pad that safeguards handlers of sharp-edged materials and hot objects.

One pair of guards, third from the left in the bottom row, resembles a handball player's gloves, but actually are worn by a cable former when soldering a protective metal sleeve over spliced cable. During this operation the worker smooths the hot-solder joint with his gloved hand to form a firm bond between the end of the sleeve and the cable's outside cover.

Manufactured by the Olympic Glove Co., Inc., of New York City, these hand protectors are sold in pairs or singly. Then only the worn-out glove has to be replaced. Some guards are even reversible: fit either hand,





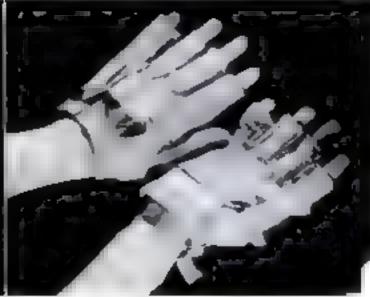


The open-end leather mittens at left above are worn by chippers—workers who scale off the rust and old paint from ships in drydock. Hand pads (center), reinforced with steel ribbons, are

for manhandling steel sheets and lumber. They are reversible—will fit either hand. The steel-rib-boned half gloves shown at right are worn by grinders and punch-press operators.







Worn either on bare hands or over gloves, the saddle-leather protectors at left above are for picking up sharp-edged materials or hot objects. The hand guards (center) protect bundlers using

heavy twine and workers handling cartons and fiberboard. Resembling handball players' gloves, the ones without fingertips (right) are worn by cable formers during soldering operations.

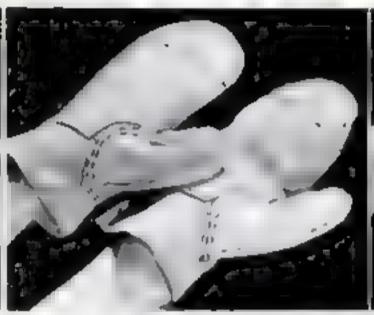


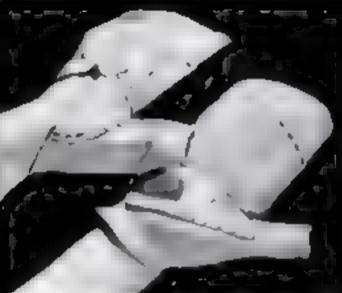




Ashestos gauntlets (above, left), quilt stitched on the palm to lessen fraying and lined with wool felt, are for working with hot or rough materials. They are reversible, as are the two-finger mittens (center), made of asbestos and leather. In this

pair the index finger has its own sheath, while the last three fingers fit into another, wider sheath. Welders wear these nuttens, as well as the heavy leather gauntlets at right, which have a reinforced crotch strip between thimb and forelinger

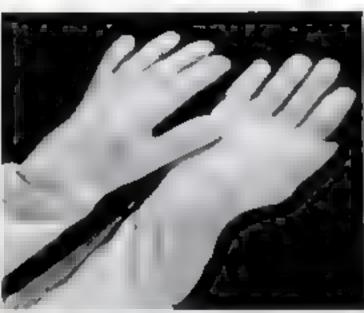






The three pairs of leather hand protectors above are worn for jobs that require the handling of sharp metal sheets, bars, and other rough materials. They are stitched with metal staples to take

hard wear Reversible mittens at left cover the entire hand. The guards at center have open ends and backs. The "claws" at right permit better grasping motion than mittens.







Tough-rubber gauntlets (above, left), for those who work around acid baths, protect the wrist and part of the forearm. The woman's nylon, lint-free glove at center, worn by workers in hosiery

nulls, is reversible. The steel-stitched, felt and leather arm protector at right guards workers against abrasions when they are lifting heavy objects and doing overhead work.

Army's new transporter for household goods is shown passing one of several tests for ruggedness. Here, door holds overload thrown against it when crate is hoisted by rear shackles only.

Folding Crate Stops Thieves

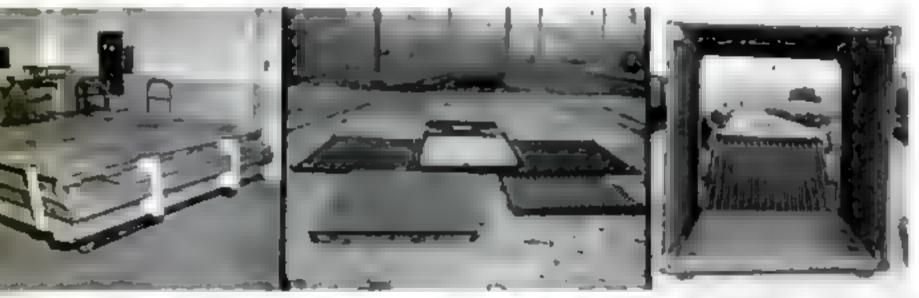
U.S. Army photos

THIS collapsible metal crate, with a combination lock on its door, fills the Army's prescription for one of its most bothersome peacetime headaches: pilferage of overseas shipments of soldiers' household goods.

Quickly set up from six panels of corrugated aluminum, the new "transporter" measures 8 ft. 6 in. long, 6 ft. 3 in. wide, 6 ft. 10% in. high. It weighs only 900 lb. but can carry three tons. Weatherproof, it has "breathing" vents to stop condensation inside.

One of several models under development by the Transportation Corps, the crate can be handled by crane or fork lift or dragged on its skids. It fits into a railroad car or moving van, as well as a ship's hold. Two can be joined end to end to make a single doublesize container, and three can safely be stacked one on another.

In tests, the transporter supported nearly ten tons on its roof, was dropped on one corner fully loaded, and rode through an 11m.p.h. collision—all undamaged.



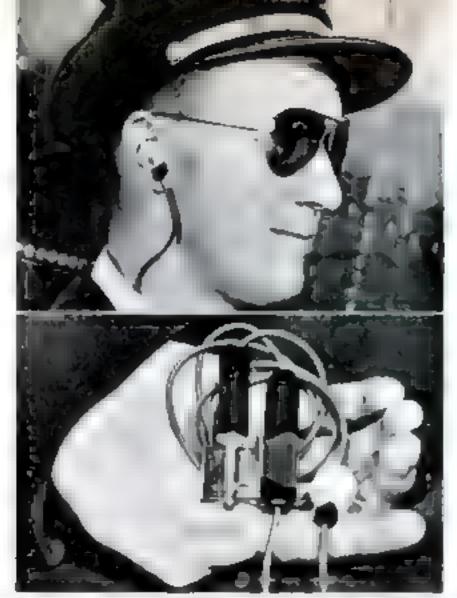
Knacked down for shipment, transporter is bundled with metal straps into a package less than a third the size of its own capacity. Each of six panels weight only about 150 lb. Two men can

To balk thieves, bolts bolding rear panel (left, below) are tightened from inside. Corner bolts pass through three fittings, one attached to each of panels that meet there. Bolts holding front

assemble them in five minutes. Flanges along top and bottom of side panels lock into notches in roof and wood-decked floor. Rear panel is held by six bolts; front, serving as door, by four.

panels have to be worked from outside (center). But their heads then are covered by shutters operated by combination-locking handle under a cover plate in center (arrow, right).





Earphone Takes Load off Pilot

SMALL as a nickel, this miniature Fly-Fonc® radio headset fits snugly into a pilot's ear and brings signals directly to the eardrum. The maker, Air Market Associates, of Dallas, claims that the new device not only does away with the fatiguing pressure of old-type headsets but is 12 times more sensitive. The whole unit, shown held in the palm of a pilot's hand, weighs only 2% ounces.

Plastic Guard Saves Face

When sparks fly, a worker wearing this new face shield is fully protected. A hard fiber top guards the forehead, while a non-inflammable, vinyl-plastic visor covers the face and neck. The turn of a knob adjusts the headband to fit any head. Made by the Mine Safety Appliances Co., of Pittsburgh, the helmet also offers protection against flying particles and splashing acids.





Heimet Helps Smog Study

THE lady under this plastic headpiece is getting a dose of smog, made up of smoke and fog. Photoelectric cells attached to glassless goggles record blinks due to eye irritation. She reads a book to produce uniform reactions. The test is part of a study being made by Stanford Research Institute to find out more about the smog that often blots out Los Angeles' sunshine.

Glasses Built into Football Mask

This mask of cellulose acetate, with optically ground lenses, is science's latest contribution to football. Intended for players who require glasses, the new mask covers the face from forehead to upper lip. Breather holes prevent fogging. A rim of foam rubber cushions the shield against the cheek and forehead. The mask was devised by Dr. Edward Chase, of Los Angeles.





Workmen at left are unrolling the radome tarpaulin. A segment of the tent's skirt will then be fastened to the rim of the semi-circular aluminum framework seen in the center.



2 Here the radome goes up, much like an old-fashioned buggy top, with the fabric supported by a senes of hoops. It is raised by ropes operating over pulleys on the V-shaped masts.

Radar Takes Cover Under the "Big Top"

RADAR, so long kept under wraps for security reasons, now has gone under cover again. But this time it is "cover" in the literal meaning of the word — shelter to protect expensive and delicate equipment from the destructive elements of nature in extreme chinates. "Radome" is the name for this balloon-like housing that is thin as paper, sturdy as steel, and does not interfere with the transmission of radar signals. Yet it is held up by air alone, with no supporting structures to get in the way of a radar set's swinging arms.

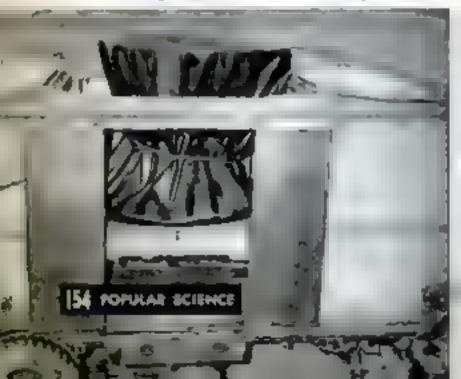
The big fellow shown on these pages is an Air Force job. It is 36 feet high, 50 feet in diameter at the base, and is made of Fiberglas[®] coated with synthetic rubber. When inflated, it is strong enough to support two inches of snow or ice, and to stand up under

130-m.p.h. winds, If internal heating is insufficient to remove ice coatings, a "mechanical spanking" — a slight alternate deflation and inflation — will do the trick. For hot climes, the big bag can be air-conditioned.

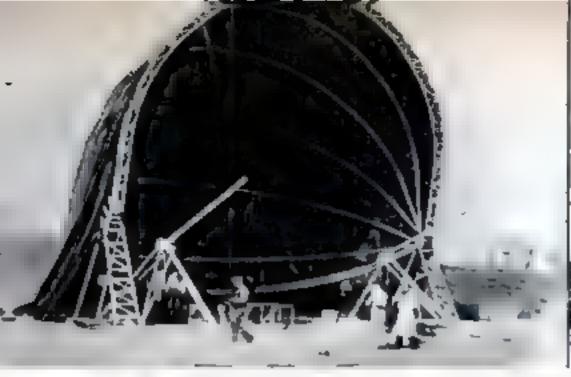
Illustrated at the bottom of this page is the baby counterpart that does the same job for the Signal Corps' mobile radar units. Nine feet in diameter, this miniature version is made of Neoprene®-coated Fortisan® rayon, which, says the Signal Corps, transmits radar signals better. It is inflated by a unit from an ordinary tank-type vacuum cleaner.

Both radomes were designed by the Cornell Aeronautical Laboratory, Buffalo, N. Y., in conjunction with the Air Force's Watson Laboratories and the Signal Corps Engineering Laboratories.

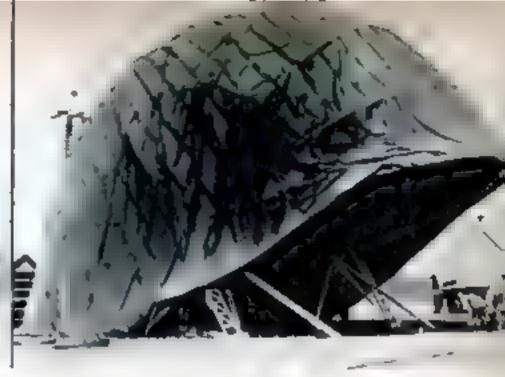
Baby radome takes a bow. At left below it is shown deflated, and serving as a cover for the gun-directing radar set that is being raised from its trailer storage compartment. Bubbled at right, the thin fabric is held up by an internal pressure of only \(\) ib. per sq. in. from a vacuum cleaner







3 This half-way-up view clearly shows the raised circular concrete hp that rims the 50-foot-diameter floor. Wooden framework in center surrounds entrance from underground tunnel.

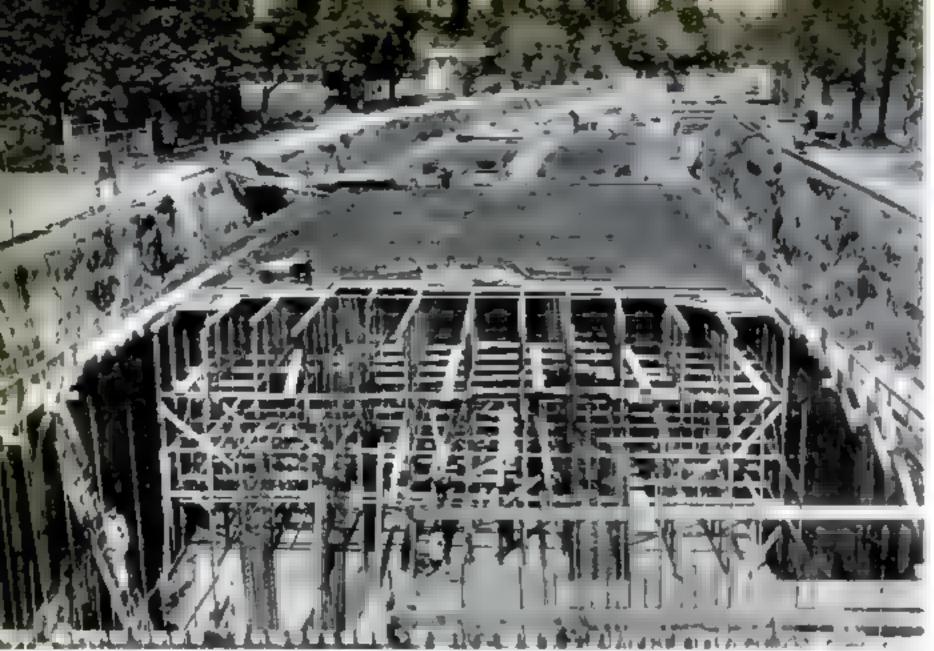


4 Coming down. Next step is to clamp the hem of the radome's skirt to the concrete lip. After it has been inflated, the hoops are collapsed and the raising derricks dismantled.



5 All blown up. Engineer walking up the side with the aid of a rope doesn't even make a

dent in the taut fabric. Special pressurizing machinery is used for inflating the big top



Water Stored Under Street

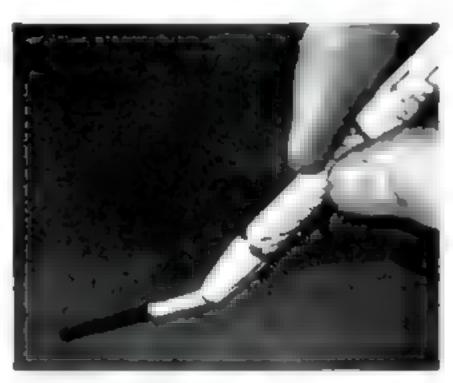
THE city of Santa Monica, Calif., neatly solved the problem of where to store 5,000,-000 gallons of drinking water by digging a reservoir under a wide, hilltop street. The

pavement was ripped up and a trench 660 ft. long, 29 deep, and 50 wide was dug and lined with two feet of poured concrete. Four feet of earth were then put on top of the giant tank and the pavement re-laid. Pavement and traffic are supported by 64 concrete columns.



Ax is All-Purpose Tool

This ax tells almost everything about a tree—besides cutting it. The reverse edge has a circular cutter that brings a neat core out of the trunk for measuring growth rate. One-foot marks on the handle permit quick calculation of tree diameter. When handle, held erect at arm's length, covers tree, distance from you to tree is same as tree's height. Woodsman Tool Co., of Tacoma, Wash., makes the ax.



Crayon Tells Temperature

CRAYONS that tell how hot a piece of metal is are now available for temperatures from 130° F. to as high as 2,000°. A smear made with a Tempilstik® starts to liquefy only at the temperature marked on the crayon. Used in welding, tempering, forging, and casting, the heat-sensitive crayons — and similar pellets and lacquer — are made by the Tempil Corp., of New York City.

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Briquetting process may reclaim mountains of sawdust like this one, covering two scres.

W/ALTER W. LETTS doesn't look much like that mythical giant of a lumberjack, Paul Bunyan. Yet he has successfully imitated one of Paul's tricks-running a sawmall backwards to make good logs out of waste. Letts turns waste sawdust into useful briquettes, finger-sized cylinders that can be burned like charcoal. Others have tried this, but few have succeeded economically.

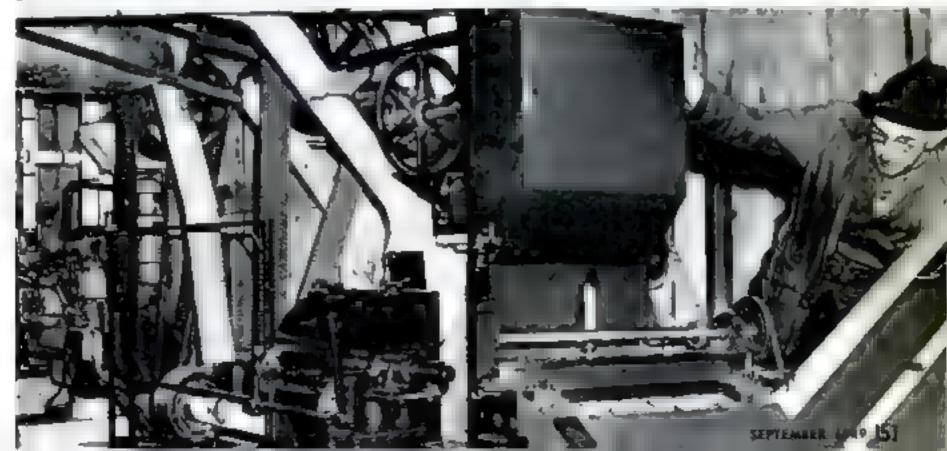
A Northville, N. Y., lumberman, Letts dries sawdust in a machine he designed himself. Its whirling blasts of hot air remove 95 percent of the moisture. A second machine then applies pressure of 12 tons per square inch to the sawdust to solidify it into the briquettes. They burn with a blue flame, leaving an ash of only 0.1 percent of their original volume.

Inside the small plant, hammer mill (foreground) gruids waste sawdust-from huge pile behind the wall-to uniform size. The dust then goes to drier that removes most moisture.



Sawdust (left) makes these briquettes (right), called Burnets® by their inventor, Walter W. Letts. Burnets burn with a very hot, even flame, can be used for the same purposes as chargoal.

The final step compresses sawdust into solid cylinders with a pressure of 12 tons per sq. in. Then the briquettes roll out of the machine like sausages and are carried away by a conveyer.



So You Think 32° Is Freezing?

THE textbooks say pure water turns to ice ■ at 32°F. But now GE researchers have proved the books are wrong. Absolutely pure water, they found, won't freeze until you cool

In a series of experiments at the General Electric Research Laboratory, Robert Smith-Johannsen carefully cooled drops of water in a special apparatus (shown in drawing and photos at right) while he watched for ice crystals to form in the drops. No ice could be seen in pure water until the temperature fell to about -4*!

Ice still melts at 32°, though. And water mixed with ice freezes at 32°. It is absolutely pure water free of ice crystals that won't freeze down to -4°. Some impurities make water freeze above that point, although always below 32°. Apparently the impunities "look" like ice crystals to the water molecules. The water freezes on them just as it would on real ice crystals.

Scientists have known for a long time that water could, under certain conditions, be cooled below 32° without freezing. This "supercooling" was always considered a freak, but must really be normal, says Johann-100

The GE researchers tried treating pure water to make it freeze above -4". Nothing worked - except adding impurities. They found, however, that passing high-frequency sound waves through the water lowered the freezing point still further. Apparently the ultrasonic waves changed the size or shape of impurities still left (even the purest "pure" water has some) so that they no longer could fool the water molecules.

What makes a mud puddle freeze on a night when the thermometer hovers at 32'? Johannsen answers: a tiny ice crystal from the much colder sky must fall into the puddle. He says, "The only way to get water to freeze at 32" is by adding an ice crystal!" Peering through Polaroids®, Johannsen can light polarization while water does not. Vacuum Diagram below shows simple equipment used. Water temperature is precisely controlled through combination of cooling by conduction to the liquid-air flask, heating by electric wires. COOLING STUD COOLING NOCK COPPER

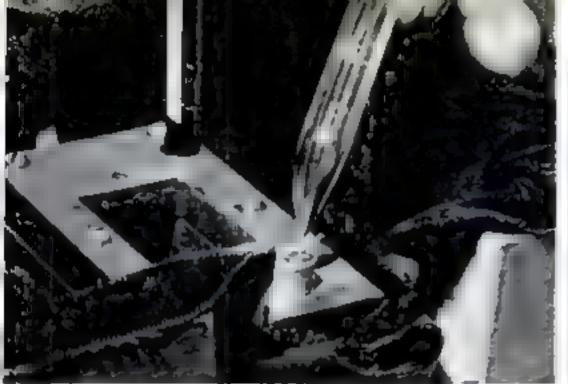
it down around 4° below zero!



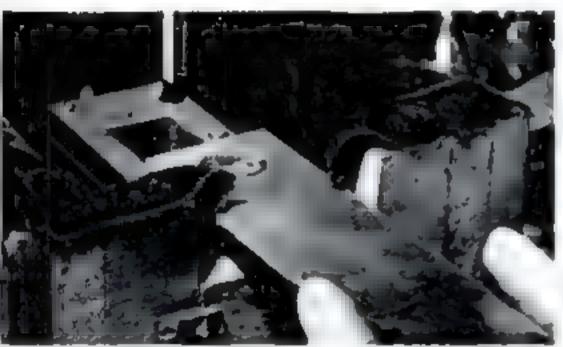
spot the timest ice crystal because it changes Red: (bottom) has liquid air to cool water.

COLUMN III

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Placing film of mercury on stud stop cooling block is first stop in finding true freezing point of water. Mercury gives mirror surface for easier observation, aids heat conduction.



2 Drop of pure water is held on ultra-thin plastic set into hole in metal strip. The plastic rests directly on the mercury-coated stud, so water quickly acquires stud temperature.

3 Rhoostat changes temperature of studand water-until ice crystal forms, as it has below. Standard thermometer stuck in cooling block shows temperature at which ice appeared.



New Washer Squeezes Dry

WATER is squeezed out of the family wash in almost the same way used by an old-fashioned laundress in the new automatic Bendix washer below. When this agitator type of machine finishes washing and rinsing, a vacuum is created inside the tub. This sucks the flexible plastic lining in, squeezing the wash damp-dry. Dirty water goes out the top of the hollow agitator shaft, not through clothes.

Drawings show how tub collapses, pressing water out of wash. Arrows (right) show undertow swirling of clothes as agitator twists. Below (left) tub partially collapsed; (right) lining fully collapsed.









Clothes are fed through top of vibrationless washer. Inflowing water passes through hose (at bottom of airtight cover an photo) and then through the valve in the lid's center.

These Firemen Jump to Work

FROM the top of a mountain deep in a national forest, a lonely lookout slowly seans the neighboring slopes. Suddenly his eyes focus on a tiny puff of smoke. Within a few minutes a plane loaded with paratroopers heads for the fire

These paratroopers carry no guns. They are the "smokejumpers" of the U. S. Forest Service, trained to parachute into isolated wood areas and put out a fire with only the tools dropped alongside them—there seldom is water. Then they must find their way afoot to the nearest road and civilization. In one year alone, the airborne firemen made 1,236 individual jumps, fighting fires in public and private forests in the Northwest.

Hand tools are jumpers' main fire-fighting equipment. They don't attempt to extinguish blaze, but isolate it by cutting a clear path around it, then let it burn out. Moist earth is turned to pre-



Smokejumpers of the Forest Service get ready to step into space to fight fire below. Various kinds of planes, including the reliable old DC-3—and even ancient Ford Tri-Motors—are used.

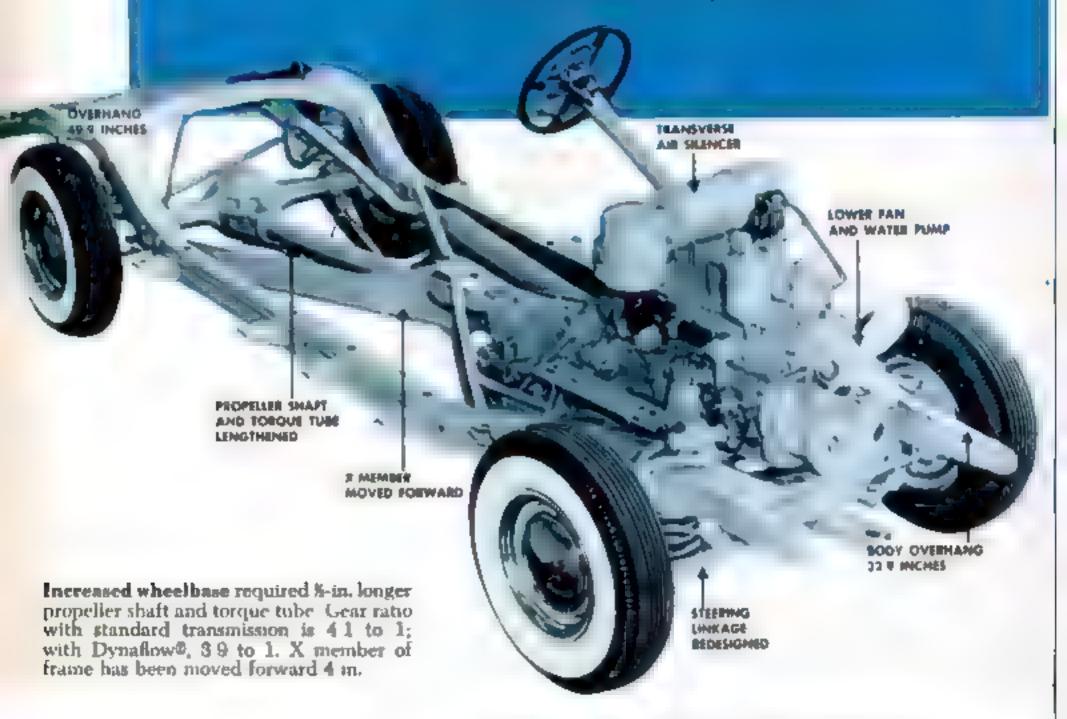
vent smoldering. Smokejumpers are most often used against small fires—frequently caused by lightning—in areas remote from roads and trails. They also rescue lost or injured persons





Buick Slicks Up Its Big Little Car

Out of production for nearly a year, the Special makes a new bid for a share of the auto market, offering incremed safety and comfort.



By Deven Francis

PS photos by W. W. Morrus

A DOZEN years ago Buick automobiles broke into the country's best-seller list with a "little" car tailored for the man who wanted something better at an in-between price. It was given the unimaginative name of "Special" and promptly became the best-

known vehicle in the company's entire line.

Last month GM's Buick Motor Division announced its new Special, the biggest "big little" car it has ever produced.

In its refurbished form, the Special, out of production since last December, is an obvious lineal descendant of the sleek car designed just before the start of the war—the car that sold like hot cakes after the war, with scarcely a change in dies. But the new Special em-

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New "buck-toothed" Buick has heavied-up, exaggerated gulle, Londed, car is 61.7 in. high, 3 in, lower. Hood is 1.7 in, shorter. Beside car is Ivan Wiles, new Buick general manager.

bodies the first major changes in nine years. Only a few of the many modifications in

the car are evident. It looks much the same. Detroit, like Hollywood, doesn't like to abandon a winning formula. But the engineers have built what amounts to a new automobile inside the familiar Buick look.

It's lower. It's shorter. It's roomier, It's quieter. For the first time, Dynaflow[®] drive (PS, Feb. '48, p. 113) is offered as optional equipment. As a safety feature, there's an increase in the driver's field of view that's little less than spectacular.

And what Buick probably will toot about most of all is the creation of what it calls a two-level system of heating. Automobile owners-and women in particular-have always complained about cold feet in the winter. Buick has mended that. At the "breath level" the air can be a comfortable 70° F. At the foot level it can be 90°. The trick lies in redirecting the flow of air from the outside and recirculating it around the feet with added warmth from a second heater.

The increased visibility came about when the stylists and body engineers got their heads together and decided on a revolution. For years, when drawings of proposed model changes were trotted in to undergo the bilious gaze of top management, hoods were sketched



Family lineage of new Special is shown by close resemblance to predecessor above. Fender line in both is carried back into door, but new car has no chrome side trim except around vent ports.

shorter and lower. Everyone thought they looked fine. But they always got lost in the shuffle. Buick hoods continued to be just about as long, just about as high as ever.

Now, the shorter hood has won out. In the new version, a bump on the road can be seen 24 feet closer to the front bumper and 18 feet closer to the rear bumper through the rearview mirror. Windshield area has been boosted to almost half again as much as on current models. "Backlight" (rear) visibility is increased even more. From the driver's view, the windshield and body pillars have been shamed down a full inch.

Structurally and mechanically, the changes are subtle. The X member in the frame has been moved forward 4 inches, permitting a shorter transmission support. Bolts are few; the frame is almost completely welded. A single, beefed-up roof bow replaces three smaller ones.

Except when Dynaflow is ordered, there, is no change in the engine horsepower or





Lights on rear fenders include tail and stop, reflector, and provision for direction signals. Lamps in bumper are optional back-up lights. Car was shortened 3% in, by pulling in bumpers



Bend on edge of front-fender cutout permits greater wheel enclosure without decreasing turning radius. Rear fender extends 7 in, lower over wheel, eliminating need for fender skirts



Heated air enters car through openings along base of windshield. Detroster air volume has been boosted 83 percent. Below air inlets are wiper cables and tensioners to prevent lash



Instruments are closely grouped in front of driver. Glare-proofed mirror for night driving a optional. Area swept by windshield-wiper blades has been increased from 379 to 523 sq. in

transmission. Its engine is a 110-hp., in-line eight. The fan and water pump have been lowered to permit a lower hood, and the fan has been slowed down to reduce noise. The transverse type of air cleaner and silencer has been adopted

All in all, the styling is pleasing. Most of the chrome has been stripped from the sides of the car. That's okay, but now they've gone and plastered still more glitter on the front end. The fact that most of the grillwork is replaceable in sections should appeal to the man who fears a parking-lot collision

In the interest of economy, the Special has abandoned the pull-type interior hood openers and substituted a key that is inserted in the front hood porthole. The idea is that the attendant at the corner filling station will carry a key around in his hip pocket to release the catch. But a screwdriver will do, if the key gets lost.

A noticeable addition inside the car is a space above and back of the instrument panel that is practically a shelf. The company is waiting for reports on that—no telling what a woman driver will deposit there.

The Special differs from the two other Buick series in equipment, optional extras, power (except with Dynaflow), compression ratios, and weight. Dynaflow is standard now in the Roadmaster, optional in the Super and Special.



New door catch is push-button operated. Handle blends into door panel, has no open end to catch clothing. Baffle inside keeps out dampness so lock won't freeze in the winter.



Arrows point to two of four large slots in bottum of door to drain off moisture and prevent rusting. All of car's interior and exterior surfaces are covered with anti-corrosion primer.



Space for feet under back of front seat allows sufficient rear-seat leg room when front seat is pushed back. Car's interior width at shoulder level is 57.1 in. in front, 53 in. in rear.



Grille "teeth" are bolted onto front bumper separately so they can be easily replaced when damaged. Bomb-shaped parking lights (not shown here) are recessed to reduce breakage.

COMPARISON OF MUICK MODELS

	ROADMASTER	SUPER	SPECIAL
CURB WEIGHT	4,362 LB.	3,947	3,797
WHEELBASE	125.75 IN.	121	121.5
LENGTH	214.12 IN.	209 36	204
HP.	150 @ 3,400 R.P.M.	115*	110*
COMP. RATIO	69 10 1	6.6**	6.3**

*120 WITH DYNAFLOW.
** 6.9 WITH DYNAFLOW.

The man responsible for the first of the Buick Specials, back in 1936, was Harlow H. Curtice. Then general manager of the Buick division, he put out a car factory-priced at \$885, weighing, in its sedan version, 3,360 pounds. Pounds are important in the automobile-manufacturing business — normally, the lower the weight, the lower the price.

Buick had sold 43,000 cars in the depression year of 1933. It was in eighth place in national sales. By 1938 it had shouldered its way into fourth place with sales of 166,000, and it kept on going up. It was the Special that made Buick (and Curtice) top bracket—today Curtice is executive vice president of General Motors.

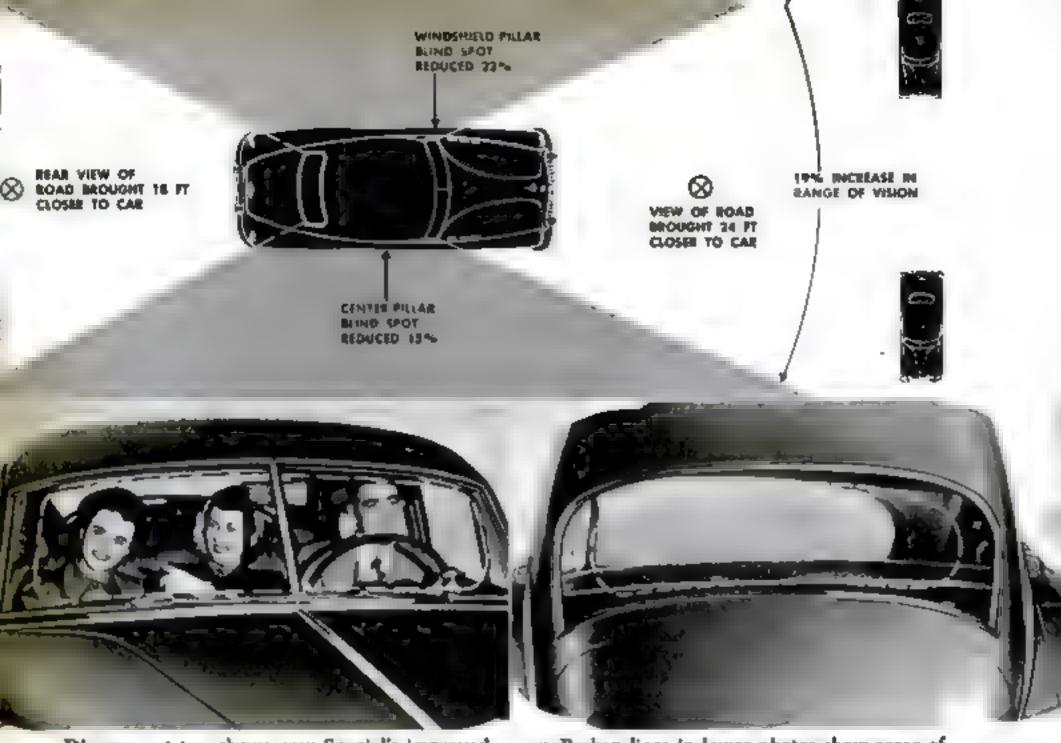
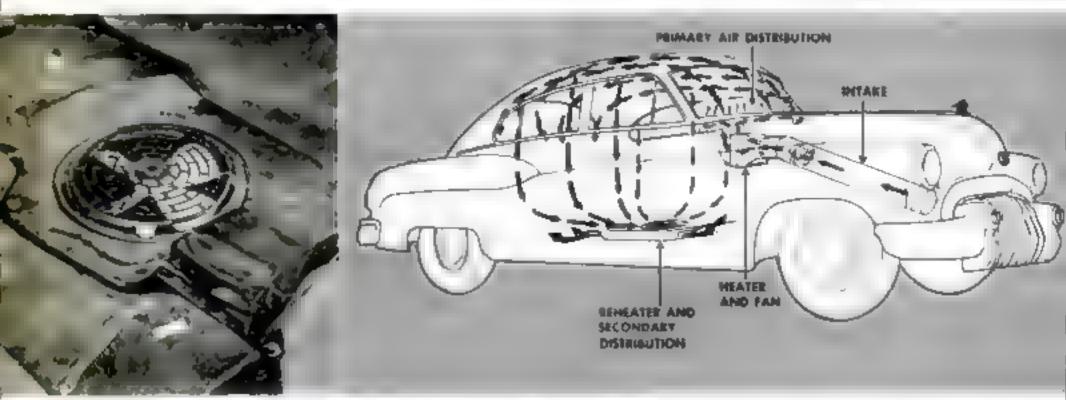


Diagram at top shows new Special's improved visibility. Moved-back windshield pillars give driver 265-foot-wide view at 100 feet ahead of

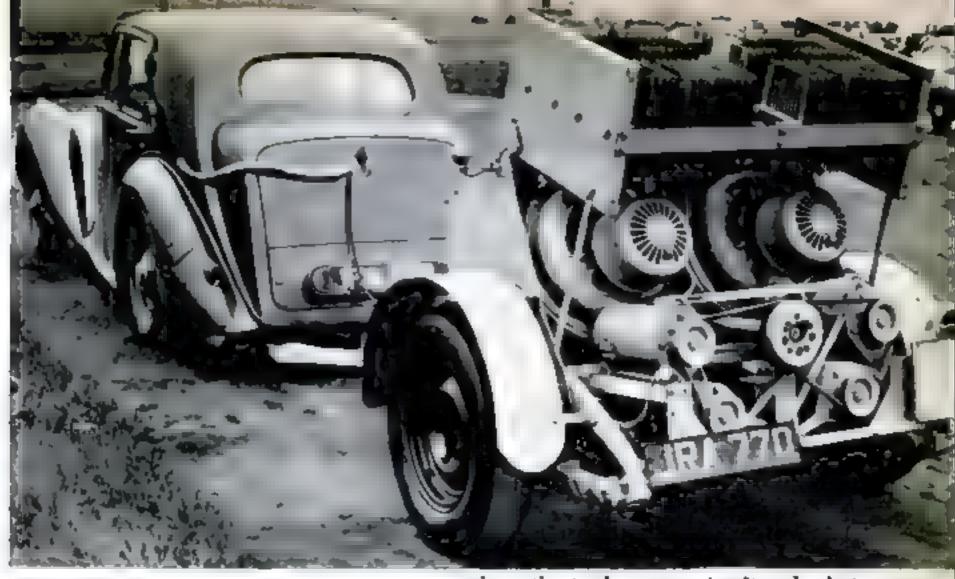
car. Broken lines in lower photos show areas of old front and rear windows. New windshield is increased 48 percent; rear window, 58 percent.

The new Special weighs somewhat more than its granddaddy, and its price, like all prices these days, is a lot higher. But it is still the hottest thing Buick has on the salesroom floor. The big plant in Flint, north of Detroit, is producing at the rate of 400,000 cars a year.

Ivan Wiles, Curtice's successor as Buck's general manager, commented to Popular Science that only the "big three" were now below Buick's price-per-pound of automobile. Watch him. He may shade the figure to make another Special give Buick another boost.



Reheater under front seat (left, above) recirculates car's air to keep feet warm in winter.



Trailer "Treadmill" Tests Cars

This British Bentley is deliberately dragging its feet so engineers can test the effects of prolonged acceleration. Since acceleration normally occurs quickly, the only way to get a good long look at what happens is to hold the car back while it tries to go faster. Here's where the trailer comes in. Its wheels turn dynamometers that provide any desired drag to simulate hill-climbing or high speeds while still keeping the car at low speeds and on level ground. Made by Rolls-Royce, it can absorb 100 hp. when actually going only 30 m.p.h. while engineers leisurely study cooling-system efficiency and clusive engine noises.



BB-Proof Lens Protects Eyes

"SAFETY-GLASS" lenses that even an air rifle can't shatter are now available for spectacles. In the demonstration above, a marksman sent a BB shot right through an ordinary lens, but could only crack the safety lens. Intended mainly for wear by children, the new lenses are a glass-plastic sandwich, like auto windows. American Optical Co. makes them.



Plastic Makes Strong TV Cabinet

Seven men demonstrate the strength of this new all-plastic cabinet for a console television set by standing on it. The cabinet is molded in a single, 35-lb, piece by a huge shell-case press originally built for the Russian Government. Molded Products Corp., Chicago, produces it for a new 10-in.-screen Admiral set that retails for about \$250.

New Tanks Hurdle Ditches

PLAYING leapfrog and laying portable bridges, new British tanks demonstrated their ability to hurdle ravines and excavated "tank traps" in recent maneuvers. One turret-less type with ramps at each end fits itself into

a gap up to 15 feet wide—and assault tanks then rumble to the attack over its back. Another model carries and lays a girder bridge, over which heavy tanks can cross a ravine as much as 30 feet wide.

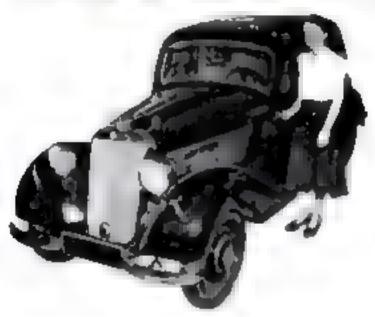


Tanks play leapfrog, as a big one rides over back of new model that cronches in a ditch. Bridge-laying tank emplaces a portable girder span, enabling heavy vehicles to cross ravine.





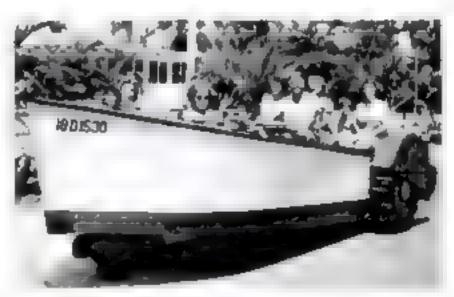
New Mercedes-Benz Powered by Diesel Engine



ALTHOUGH trucks and buses long have used Diesel power, manufacturers of passenger cars have been slow in following. One problem has been to eliminate the heavy throb of the truck-type Diesel, and another to get an adequate speed range. Engineers claim to have licked these troubles in the Mercedes-Benz shown here. The 38-hp. engine, according to the company, will turn out 40 miles per gallon of Diesel fuel, which costs much less than the 60 cents to \$1 a gallon European gasoline brings. Top speed is said to be 60 m.p.h. The car, shown at a recent trade fair in Hanover, Germany, will export for about \$2,000.

Cruises on Land or Water

HENRY J. FARRAR, former aircraft worker, gives his newly built land and water car a workout on a Miami, Fla., street at right. Below, he puts the novel machine through its paces on Biscayne Bay. Farrar, who designed and built the 20' craft, reported that both tests were successful. Attachments on the tractor type wheels convert them to paddle wheels for use in water. On land, the autoboat is steered by the single front wheel.





Smoky exhausts and expensive repair jobs usually go hand in hand,

but the smoker a state cop drags in needs only the quick treatment.

Gus Fixes a Traffic Rap

By Martin Bunn

TROOPER Jerry Corcoran likes action. And that was exactly what he hadn't been getting for the past few weeks. All the action he'd seen recently was his regular patrol. Corcoran was bored. In fact, he was more than bored. He was irritated.

He sat his parked motorcycle just off the

highway at an intersection, watching the late afternoon traffic outbound from the city. An old sedan, trailing dense smoke from its exhaust, rolled down the side road. It was almost to the highway when Corcoran noticed it. The driver barely slowed for the stop sign, slamming into second and wheeling into the main road toward the city.

Corcoran kicked the starter and roared





in pursuit. He sped through the acrid smoke and drew abreast of the sedan. The driver, a thin-faced young man, stared straight ahead. When Corcoran sounded the aren, the startled driver jerked his head around and slowed his car. The trooper waved him to the shoulder of the highway. Jerry parked his motorcycle in front of the sedan and walked back. The driver had his head out the window.

"What's the matter?" he asked excitedly.

"I wasn't going too fast."

"Let's see your registration and driver's license," Corcoran ordered. The young man fished them out of his wallet with shaking fingers and handed them over. "Henry Sutter," the trooper read.

"What's the matter?" Sutter repeated, apprehension in his voice. "I haven't done anything wrong. I'm in a hurry. I've got to get to

the city right away."

"Your registration and license seem to be

in order," Corcoran said, "but running that stop sign back there was certainly out of order."

"What stop sign? I didn't see any sign."
"Where you turned into the highway."

"I just didn't see any sign," Sutter said.
"All I remember seeing at that intersection was a lot of bushes and weeds."

"And besides," the trooper went on, "there's a law in this state against driving a car that's in such bad mechanical condition that it's a menace to other traffic."

"What do you mean—a menace to other traffic?" Sutter demanded indignantly. "There's nothing wrong with this car. It's nine years old but it runs okay."

He Didn't Know It, He Says

"I said," the trooper repeated heavily, "that your car is a menace to other traffic. It's throwing enough smoke out of the exhaust to pass for a regulation Army smoke pot,"

"This car never smokes," Sutter said flatly.
"Get out and look for yourself," Corcoran told him.

Sutter climbed out of the driver's seat, walked around back, and returned with a puzzled expression on his face.

"It's never done that before. Something must have gone wrong since I left home."

"I've heard that one before," Jerry commented.

"Honestly, I didn't know it was smoking," Sutter said. "It wasn't when I backed out of the garage. I got out to see if the trunk was locked, and there wasn't any smoke."

Jerry gave the young man a long, hard look. The trooper knew very well that the stop sign was partly obscured by brush. He didn't want to press that point too much, but he didn't want Sutter to think he'd forgotten it.

"Maybe I'm a sucker," he told Sutter, "but I'm taking your word about the smoke."

"Then I can go now?" Sutter's face brightened.

"No," Corcoran said. "There's still that stop sign and, anyway, you can't drive this smoking car. You'll have to get a garage car to tow you in."

"A garage car!" Sutter almost screamed.
"I can't take the time now. It's getting late.
Everything depends on me getting to the city. Everything!"

Corcoran froze up again. "That car's a menace," he snapped. "If you try to drive it, I'll arrest you. Make no mistake about that."

Sutter pleaded and argued so earnestly that Corcoran finally weakened. He said it would be all right if Sutter followed him to the nearest garage and had the smoking fixed right away.

A couple of miles down the highway they reached the Model Garage. Stan Hicks stepped to the shop door as they pulled into the drive.

"Hi, Jerry," he called. "Know there's a smoke screen following you?"

"I want this car fixed right away," Sutter

cut in. "I've got to get to the city."

"Right away?" Stan laughed, "How long do you think it takes to rebore cylinders and install new rings?"

"New rings!" Sutter gasped.

"I never saw a car smoke like that if the rings weren't shot," Stan said.

"What's up?" Gus Wilson asked, stepping

up beside Stan.

Sutter cut the ignition, got out, and told Gus the story of the smoke.

"The car was all right when you left home," Gus summed up, "but started smoking after you'd driven awhile?"

"That's right."

"Could be rings," Gus said, "but I doubt it.
They usually show up gradually."

Just then a convertible whizzed into the drive and jolted to a stop at a gas pump. Stan stepped over with his best smile when he saw the driver was a pretty girl.

"Fill it up with high test and make it fast.

I'm in a hurry," she mapped.

Sutter hurned after Stan. Jerry strolled after Sutter. When the girl saw Sutter, her mouth tightened.

"There's something wrong with my car," Sutter told her abruptly. "It may take some time to fix it. You know we're after you, Will you take me to the city?"

"Here's your money," the girl said to Stan. She turned to Sutter: "I have to pick up Mr. Johnson, and anyway, if you're late, it'll be just too bad." Then the convertible was gone.

Who Murdered Staunton?

"Check the plugs, Stan," Gus told him when the old sedan was in the shop.

"Number one's oily," Stan reported in a couple of minutes. "Number two is oily, too, but not as bad. The rest are okay."

Gus walked to his workbench. He rummaged through a drawer, picked up two small pipe plugs, and returned to the car. Sutter was pacing up and down nervously. Stan heard him talking to himself and edged over to Corcoran.

"You'd better watch that guy, Jerry," he advised. "He's talking to himself about somebody being dead and some money being gone. And he told that girl in the convertible, 'we're after you,'"

"I thought there was something queer

about that guy," Corcoran muttered.

Sutter had stepped to an open window and was staring out. Jerry drifted to the water cooler near the window. He heard Sutter say: "He's dead. Staunton's dead. In my apartment. And the money's gone. That girl's got it."

Just then Gus called to Sutter.

"Watch this," Gus said, pointing to the fuel pump. Gus disconnected both ends of a copper tube that ran from the pump to the intake manifold. Then he screwed the pipe plugs into the openings in the manifold and pump. "Start her up," Gus told Stan.

The engine ran smoothly and no smoke

came from the exhaust.

"So it wasn't the rings," Stan said, much

puzzled. "But what was it?"

"If you were familiar with this model," Gus explained, "the cause of the smoke wouldn't be tough to guess. The fuel pump is a dual unit. It's both a fuel pump and a vacuum-booster pump. The line from the windshield wiper runs to the vacuum side of the unit. Another line from that unit goes to the opening in the manifold. It keeps the vacuum up on the wiper when manifold vacuum is weakened by tromping on the throttle or when you're pulling hard on a hill."

"But what's that got to do with the smoke?"

Sutter asked.

"The vacuum-pump diaphragm developed a leak," Gus went on. "This allowed oil to be pulled from the crankcase and fed into the intake manifold. From there the oil went into the first two cylinders, where it burned, causing smoke."

"I see," Stan put in. "Disconnecting the

line stops the oil and the smoke."

"Can I drive it now?" Sutter cut in im-

patiently.

"Sure," Gus said, "but the windshield wiper won't work until a new diaphragm has been put in the vacuum pump and that line has been reconnected."

Under Arrest

"You can fix it tomorrow," Sutter said. "I haven't got time now." He started to get in the car, but Corcoran caught his arm.

"You're under arrest."

"Under arrest?" Sutter yelped, "What for?"

"For driving an unsafe vehicle," Corcoran told him. "That'll hold you for now. What about Staunton? He's dead in your spartment. And the money's gone. What about that?"

The trooper expected Sutter to cringe in dismay. Sutter didn't. Instead, he started to laugh. He laughed until tears were running from his eyes.

"I'm sorry," he said at last, "but it is funny. Staunton's dead and the money's gone."

"All right, all right," Corcoran said peevishly. "Let's go to the station house and see how funny that is."

"Keep your shirt on," Sutter said between chuckles. He reached in a pocket and pulled out a printed folder and several typewritten sheets. "That business about Staunton being dead and the money being gone are just lines from a play we're putting on torught."

The trooper took the folder and read aloud: "Twenty-fifth Annual One-Act Play Tournament. Final round. Avon Little Theater presents 'Another Way Out' . . . Richard Davis, a lawyer . . . played by Henry Sutter."

Sutter pointed to one of the typewritten sheets. "Here are my lines . . . Staunton's dead, and so on. Satisfied?"

"No," Corcoran said, "I'm not. What about that girl? You said you were after her."

Sutter laughed again. "I meant that our play went on after hers. She directs the company that's in the finals with us. She wouldn't take me to the city, figuring that if I didn't get there her company would win by default when our play didn't go on."

"Well, you better get going," Jerry grinned

wryly. "How wrong can I get?"

"Afraid it's too late now." Sutter glanced at the clock.

"Suppose the girl were late, too?" Corcoran asked.

"They're on first. If they start late, then I can make it."

"Who'd she say she had to pick up?"

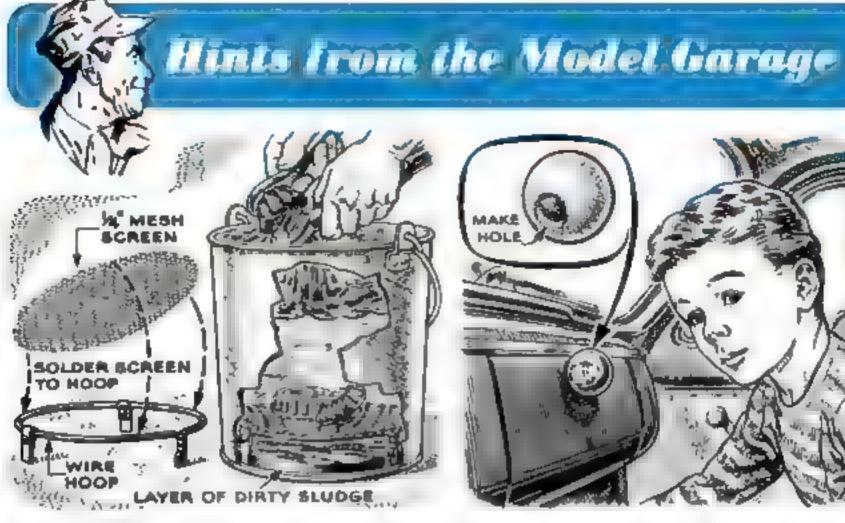
"A Mr. Johnson," Sutter said. "In Newtown."

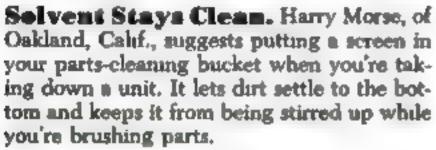
"Then she's got to pass that same stop sign," Jerry grinned.

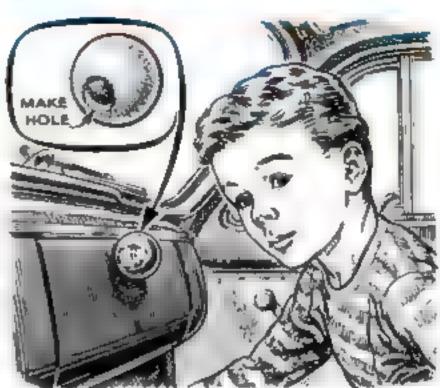
"That's right," Sutter agreed.

"On your way," Corcoran said. "I better go talk with a girl about a stop sign she isn't going to see."

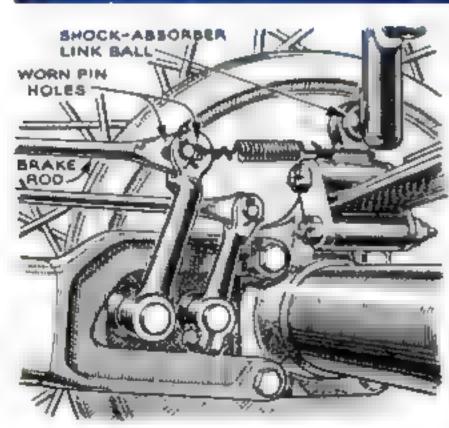




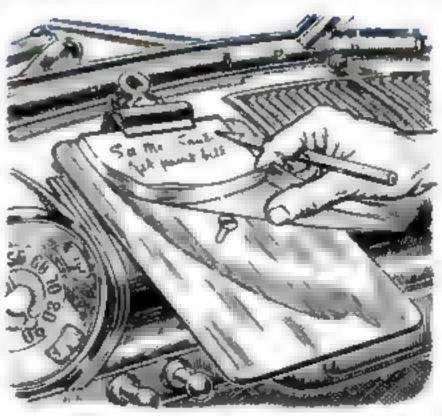




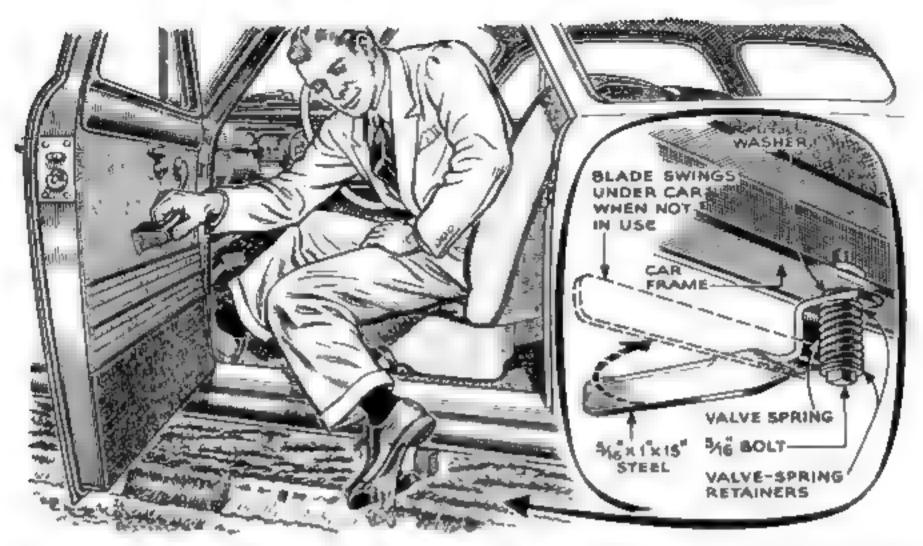
Ball Protects Children, Knobs or handles on the dash can give youngsters a bad bump on sudden stops. Sponge-rubber balls fitted over the protruding parts reduce this hazard. A dab of gasket shellae in the hole will attach the ball securely.



Spring Holds Brake Red. Model A Ford owners sometimes have trouble keeping the mechanical brakes in adjustment because of worn linkages. In such cases, it's probably advisable to install new linkages if available. But you might like to try the idea illustrated above, suggested by J. O. Troemner, of Madison, Wis. The spring takes up the slack that results from the worn pin holes, preventing the brake from dragging when off.

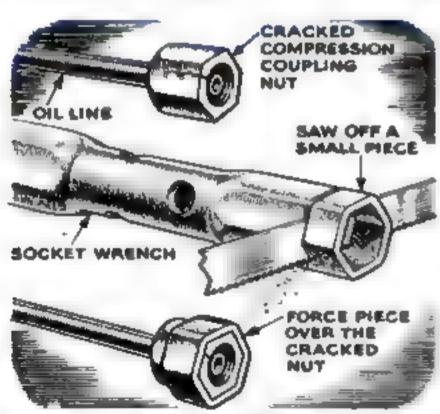


Make Notes While You Ride. A note pad is often a useful thing to have at hand in a car, especially if you are apt to be forgetful. S. D. Laing, of Burrton, Kan., made provision for one in his car by mounting a 4" by 7" piece of heavy sheet aluminum on the dash at a convenient writing angle. A single self-tapping screw holds the piece of alummum. A pad of note paper is chipped to this, and a pencil is kept in the clip.

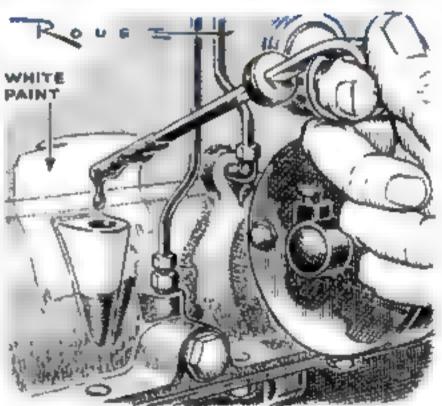


Scraper Cleans Your Shees. A shoe scraper conveniently mounted will help keep the interior of your car cleaner. The one shown was designed and built by members of the auto mechanics class at the senior high school in Midland, Mich.

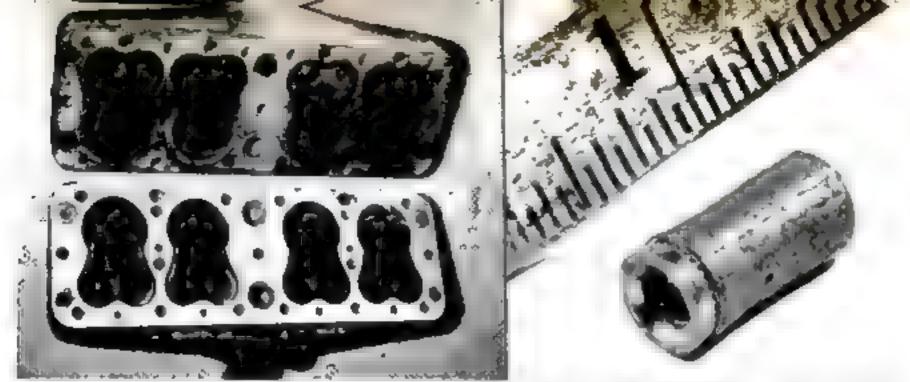
Dimensions were chosen to suit a new Hudson, an existing hole being used to mount the scraper. By changing the dimensions, you could adapt the scraper to other makes. It might be best, however, to bend up a strip of tin first as a template.



Socket Repairs Oil Line. When an oil line began to leak because of a cracked coupling nut, Norman EnHolm, of Lake Mahopac, N. Y., made an effective repair in this way. After disconnecting the union, he selected a hex socket wrench that would not quite fit on the nut. He then hacksawed a piece off the socket, squeezed the cracked nut together with a clamp, and drove on the collar. It stopped the leak.



Keep Your Oil Clean. The dirt and grit that gets into your crankcase through the dipstick hole may not amount to much, but why take a chance? Scrape the accumulated oil and dirt away from the opening occasionally so you won't shove it inside by accident. At the same time, apply white enamel around the hole. It will make future cleaning easier and help you locate the hole to replace the dipstick.

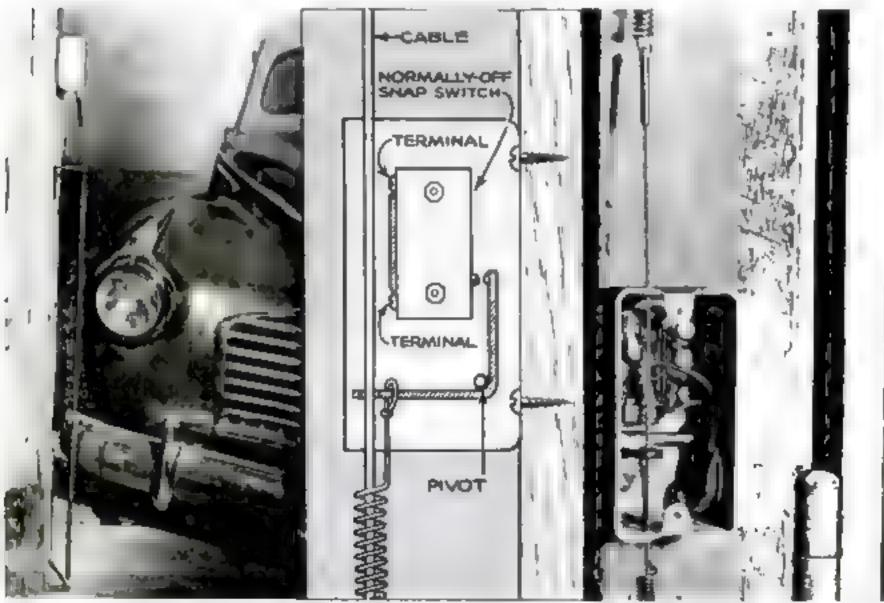


Anchors Repair Aluminum Head

If the water-circulating holes in an aluminum cylinder head have eroded away, lead-jacketed anchors used to set bolts in masonry (see upper right) will make a repair. Directly above, at the top, is an eroded head and below it one fixed in this manner.

Pick an anchor a trifle larger than the hole.

If the largest available is too small, wrap with a strip of sheet lead. Cut the anchor short so it won't extend too far into the jacket. Clean out loose material from the eroded hole, but don't smooth it. Drive in the anchor until almost flush and peen over to fill all cracks. Then dress down flush by rubbing the head over a large sheet of emery cloth laid face up on a flat surface.—A. J. Hurst, Milford, Ohio.



Bell Guides Car into Garage

MANY garages are so placed that you must turn a sharp curve while entering or leaving. W. E. Nichols, of Santa Monica, Calif., solved the problem as above.

When the bumper strikes a spring-loaded cable stretched parallel to one side of the

doorway, a pivoted lever attached to the cable turns on a snap switch, ringing a doorbell mounted in the garage. This shows the driver he is in the correct position to proceed without striking the doorway on either side. A similar system could also be used to warn that you are so close as to risk scraping the fenders on the right-hand side.



Rear Deck of Special Car Raised Hydraulically

NORMAN E. TIMBS, auto designer of Van Nuys, Calif, stands at the rear of his \$10,000 ultra-streamlined car. The chassis is of tubular construction with independent rear suspension by means of a swing axle. Although

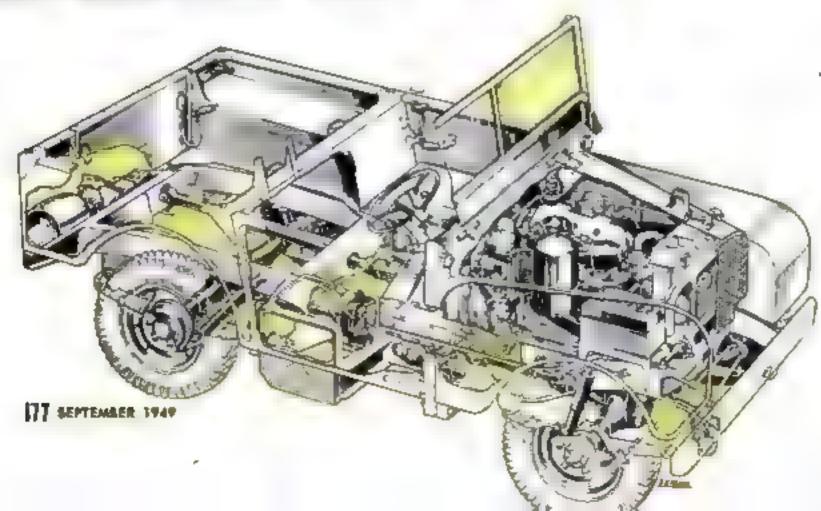
the wheelbase is 117", the 2,300-lb, car is 210" long. A late-model Buck engine behind the driver's seat powers the streamhner. The hydraulically lifted rear deck covers engine, gas tank, and spare wheel.

British Land-Rover Built for Brush Country

DESIGNED for highway travel as well as work in rugged country, this vehicle built by the Rover Co., Ltd., a British concern, is



powered by a 4-cylinder, 97.29 cu, in, engine of 50 hp. The transmission includes a transfer assembly that gives both two- or four-wheel drives and eight forward speeds. There are power take-offs at the rear and in the center of the chassis, and a winch at the front. The all-welded frame has five main cross members. Side members are 6" deep at centers and 3" wide throughout. Wheelbase is 6'8" and overall length 11'. Tires are 6 by 16. Pictured here without a top, the Land-Rover® can be fully enclosed. The body is aluminum reinforced with steel.





Blinker Also Gives Work Light

A TRAFFIC-warning signal and work light are combined in this repair lamp, made by Alden Products Co., Brockton, Mass. A blinking red signal faces traffic, a continuous white light illuminates the work area. For use, it's opened as above and a 17' cord plugged into the cigar-lighter socket. Closed, it fits into the glove compartment.

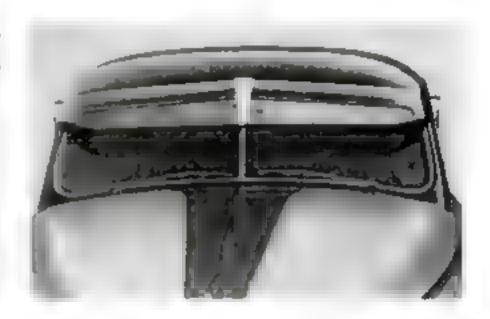
Visor Cuts Day or Night Glare

BLUE-TINTED glass on this new automobile visor is said to offer glare protection from both aunlight and headlights. In addition, the transparent area allows you to see overhead traffic signals without neck-craning or crouching. Made by Knowles-Fisher Corp., Cowanda, N. Y., to fit most makes of cars, the visor is attached to the rain gutter with meanspicuous clamps. It retails for about \$30 and can be installed in a few minutes.



New Fabric Tops Convertibles

FABRIC woven of Fiberglas® yarns coated with Vinylite® resins is now being marketed as a material for covering convertible tops. Developed by Cordo Chemical Corp., Norwalk, Conn., the fabric doesn't stretch or shrink and can be cleaned with soap and a damp cloth. It's available in black, tan, maroon, light gray, and dark gray.



Telescoping Clothes Rack Wedges Inside Auto



MADE of two telescoping steel tubes, this clothes tree is kept in position by pressure against the roof and floor. Williams Mfg. Co., Anaheim, Calif., prices it at about \$4 in black finish, \$7.50 in chrome. The notched arm holds 20 hangers,

Spinner Twists Out of Way

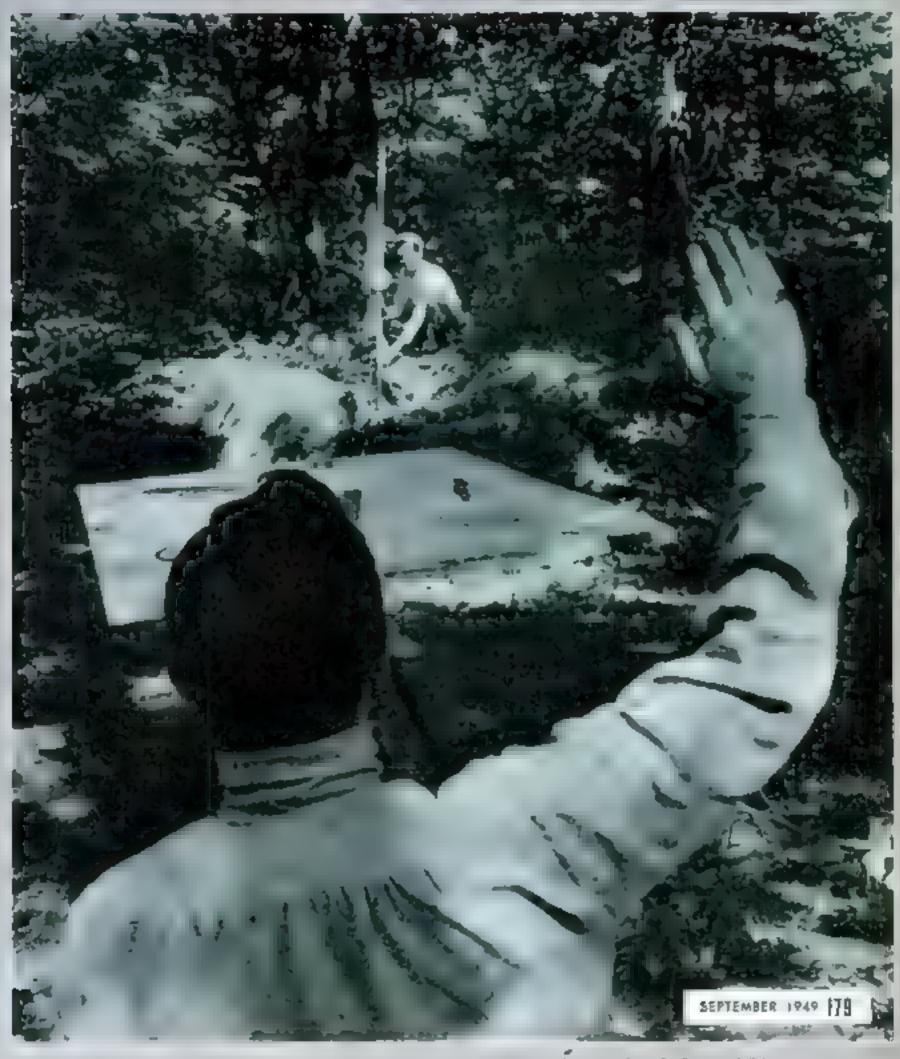
Pressure a small button allows this steering-wheel spinner to be flipped down if you



don't want to use it. It clicks up again just as easily. In either position, the knob clears the horn ring. The spinner is made by the Santay Corporation, of Chicago.

Mechanics and Handicraft

How to Make Contour Maps
Internally Carved Lamp
Switches for Your Power Tools
Hurry-Up Photography
Build Your Own Intercom



With dime-store equipment, you can map contour lines of your land. Page 180.



Here's all you'll need to buy to make a contour map. Spirit level, drawing compass, protractor, ruler, and pencil came from dime store.

A 50' engineer's tape is shown, but plainer one will do. Note magnetic compass, also from dime store, taped to board at far edge.

How to Make Contour Maps

By following this simple method, you can create a map of your land that will help you make the most of its features.

By Sheldon M. Gallager

PS photos by W. W. Morris

FITTING a house, or any other man-made feature, to a piece of land is like buving a suit of clothes—the tailor must know your special dimensions and contours before he can make it fit right. Only there's no trying a house on for size, no taking it back for a second fitting. It's got to fit the first time.

To do this, whether you're planning a home, adding a wing, putting in a driveway, or just laying out a back-yard rock garden, you've got to know how the land lies—literally and accurately. If you don't, you may find yourself trying to do a bulldozer's job with a garden trowel,

That's why PS decided to test out a simple method by which you can make a contour map of your land that will show its every hill and hollow, every curve and cranny. Such a map will help tell you where to spot your buildings, how to make the most of the land's natural features, and exactly how much digging or filling may be required.

To put the method through its paces, we selected the roughest, toughest land we could find—a rolling, rocky, hillside acre, complete with steep slopes, ragged outcrops, dense underbrush, and even a sheer 15' drop. If the method worked here, it would work anywhere

Called the plane-table method, it's perhaps the simplest of all surveying techniques. It requires no expensive instruments, no complicated mathematics, and no special knowhow. You make the map in the field, watch it grow right before your eyes as you work.

As the name implies, you use a table to make your map on, drawing in the contours as you go. Those contours are simply imaginary lines connecting points of the same elevation. Your job is to find the points and connect them. Here's where the table comes in. The idea is to set it up level at a point of known elevation and then sight other points of similar elevation from the table.

You'll need a helper—a rodman, in surveyors' lingo—to hold a graduated marker pole
while you make your sights. The pole should
be at least 6' long and marked off into inches.
To make it more readable at a distance, you
can paint the 1' sections alternately black
and white. A small circle of cardboard, divided into four equal segments alternately
painted red and white, is thumbtacked on as
a sighting target. If you want to get real
fancy, cut a small hole in the center so the
rodman can read the markings accurately.

Next you'll need something to let you sight a straight line from your table to your rod-man's target. In its fancier versions, this is called an alidade. Commercial alidades come with telescopic sights, built-in levels, and vernier adjustments. But a 24" ruler with a brad hammered in at each end near the edge will do the trick as well—and can be bought for two bits. Sight along the ruler, lining up the two nailheads with your eye, and there's your alidade. Always keep the same end of the ruler toward you.

To sight a contour point from the table, you first direct the rodman to walk up and

downhill in a radius from the table with the target pinned to his marker pole at the same height as the table. A measured cord from the pole to the table keeps the rodman at the same distance at all times—provided he keeps it taut. When the target is level with your table, you draw in the sight line on the map along the ruler's edge. This gives you the rodman's direction. Scaling his distance on this line then gives you his exact location. This represents a contour point of the same elevation as the table's.

Determining Distances

The vertical distance between each contour line is called an interval. The one you select should be governed by the roughness of the terrain. PS chose 3' because the land was hilly and the area fairly large. To get sufficient detail on flatter ground, however, you may need to use a 2' or even a 1' interval. The smaller the interval, of course, the greater the detail.

The horizontal distance between contour points will also depend upon the way the land lies. Most of the time, the PS rodman was at the end of a 24' cord, but where the contours turned too sharply to be plotted accurately at this length, the distance was cut to 12', and at some points, even to 6'.

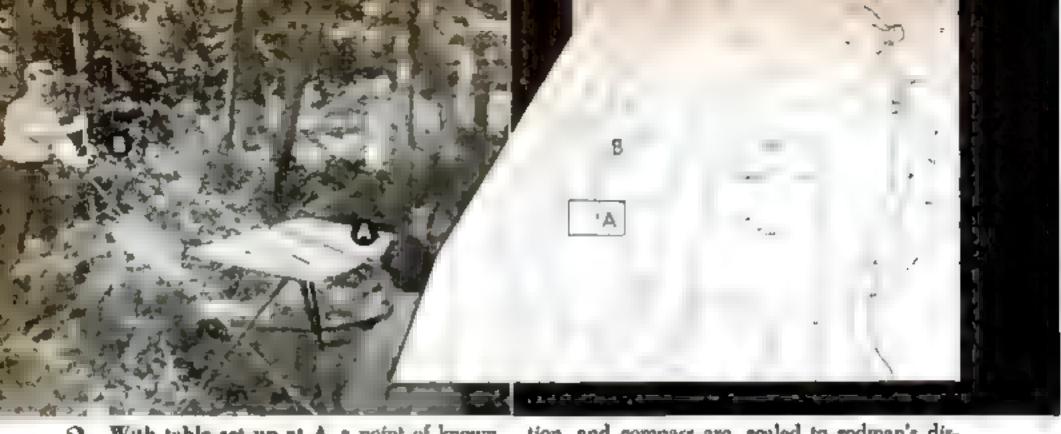
About the only piece of equipment you can't buy in a done store is the table, and this you can beg, borrow—or make. The top can be any board that's reasonably flat and about 20" by 30" big

To support the board, you'll need a tri-

I First step, after boundaries have been drawn in on map, is location of points where contours cross a boundary, in this case the north one. Table is leveled up over lowest point, considered zero, and sight is made uphill along staked-out boundary. Then, since table is 3' high, point on boundary where sight line meets ground is start of 3' contour, and

stake is driven in to mark it. To find start of 6' contour, move table over 3' point and repeat process. When you've reached highest point, here 27', you're ready to begin working across land. Point on map representing corresponding point on land is placed over stake, not center of table. Map shown is more complete than yours will be at this time.





With table set up at A, a point of known elevation, rodonan walks up and downbill with target at S' mark on pole. Line from pole to stake under table keeps rodonan in 24' radius. When target is level with table, sight line is drawn in plong ruler to give rodonan's direc-

tion, and compass are, scaled to rodman's distance from map, is swung from A. Point where are intersects sight line is thus same height as table's, and line AB becomes first leg of contour. In actual practice, you would start with table at a known point on boundary.



4 Called radial method, this trick lets you plot contours that turn too sharply to be followed easily, or features inaccessible with table, such as sheer 15' bluff shown in map close-up at right above. Here table is set up at known contour point, and several sights are

18

made to different points of equal elevation. Distance from table to each of these points is measured horizontally and then scaled onto corresponding sight line on map. Connecting the resulting points with a line then provides the contour's shape, in this case, the cliff profile.

pod that permits it to tilt and swivel. This can be a photographer's tripod, an artist's water-color easel, such as PS used, or just three sticks of wood hinged to a triangular block. Adjustable-length legs make it easier to level the table and adjust its height, but you can do this with fixed-length legs by simply spreading them apart. If you make your own tripod, fasten on the board with a single, flat-head bolt, so the board will swivel, and use a wing nut for easy tightening.

You'll have to adjust the table to the same beight every time, so keep a weighted piece of string of the right length tied on underneath and be sure it just touches the ground when you set up. A good working height for the table is 3'. This has the added advantage, if you're using 3' intervals, of allowing you to locate boundary-line contour points by sighting directly into the ground instead of on the pole

You'll have to keep the table level, too-



3 With table in same spot, so tal contour leg is made by repeating procedure except here rodinan's pole is tied to stake at B, instead of to one at table. When rodinan's target is level with table, sight line AC is drawn on map, and compass are is swung from B

Point where are intersects sight line is rodnan's position, and line BC becomes second leg. So line as rodnan remains in view, any number of legs can be made in this way without moving table. Contour lines between points are drawn in by eye to approximate land's shape.



5 Locating trees, rocks, and other features not shown by contours will help you do tide what must come out and what you'll want to keep when improving the land. Here proceed its same as radial method described proving a except that no rodman is required

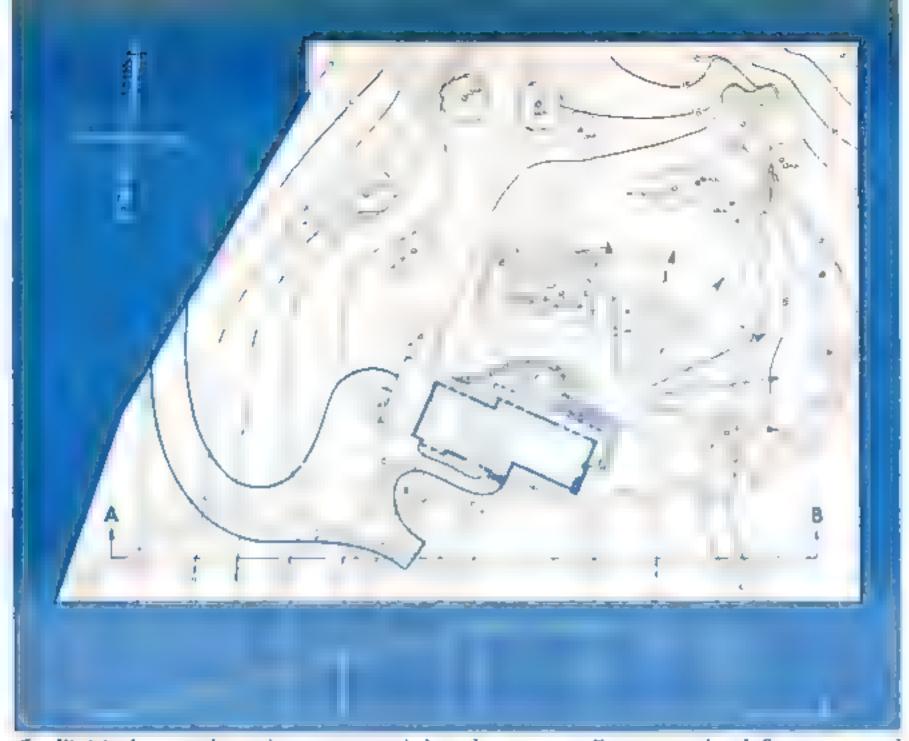
smee only direction is needed, not elevation With table at some already plotted contour point, sight direction of each surrounding treated draw in sight line on map. Then measure distance from table to each tree and scale this is sailt line to gave you tree's location

that's what in kes the method work. This is done so that the sight line along your alidate to the rodman's marker pole will be level. Then when you sight on the pole is a point of the equaling the table's height, you know that the bottom of the pole is on a point of the same elevation as your Has a store A 50-cent spirit level is all you need but a member to level the table along to the axis to make sure it's level in all directions. And because the best table will wobble a bit, par

ticularly when you're working on it, keep checking to see that it stays level

Fo find the boundary lines of your map locate the boundary stakes on your land. Use cord and stakes to establish the corner angles and measure these with a protracted it your trigonometry is rusty. Measure the distances in between with a tape. With these angles and distances, you can then scale the boundaries onto your map.

The map scale you use will depend



6 Finished map shows how contours help determine where house, driveway, and other features must go for maximum use of land, minimum excavation. Driveway crosses contours where they are widest apart, since grade is most gradual here. Note how placement of house makes use of natural dip in land at east end for car port underneath. Plotting in forest area shows how driveway turn-around can be shaped to dodge trees, preventing need-

less cutting For greater detail, flat area around house was contoured in I' intervals. Quick way to get profile of any section through land is shown below map. Line is drawn through desired section on map, here at AB, and base line is drawn parallel to it off map. Vertical lines are dropped to base line from points where contours cross line on map. Scaling elevation of contours onto corresponding vertical lines and connecting resulting points given profile.

upon the size of your property and of your board. If your longest boundary is under 100', you may be able to scale it K" to 1'. If longer, you'll probably have to use K" to 1', as PS did. Needless to say, the larger the scale, the bigger the map, and the easier it will be to plot your contour points.

Compass Keeps Map on Beam

Before you begin plotting, line up one of the drawn-in boundaries on your map with its corresponding staked-out boundary on your land. Place a magnetic compass on the map and draw in a line in the direction the needle points. Now if you tape the compass to the board over this line, you'll always be able to keep the map oriented with the land by rotating the board until the compass needle lines up with the line on the map.

From here on, the accompanying pictures and diagrams show you how the method works and from there on, you're on your own. In a coming issue, PS will show you how, with plywood and plaster, you can turn your contour map into a three-dimensional relief map, so you can really see how the land lies.

One final hint: Don't scorn the aid of willing helpers. While this is basically a two-man job, there are always trees to be chopped, underbrush to be cleared, and equipment to be carried. And don't let a sudden rain storm catch you mapping—take along some sort of cover, like a sheet of oil-cloth or heavy paper, to keep the map from getting wet.

And if you're wondering just how much all this may save you in money, just subtract the \$2.00 you've spent on equipment from the \$200 or more a professional survey might have cost. That's your pay for a little weekend work in the woods.

Two-Way Lamp Displays Marine Carving

By Harry A. Zoback

Author of "Internal Corving in Plastics"

YOU never have to feed the fish in this aquarium or worry about the cat snatching them for a quick snack. The aquarium lamp also serves a double purpose—a reading lamp and a night light. The fish, internally carved in plastic, are edge-lighted by a 7-yeatt bulb in the base that throws a soft glow throughout the room.

The base is K" black acrylic. Front, back, and top are made by grooving a single piece as shown in the drawing below. The grooves are laid over a strip heater until phable. Then the back and front are bent 90° to the top. It's easier to cut out the rectangle and drill the holes before bending the plastic. Make the opening with a jigsaw or coping saw, and file and sand the edges smooth.

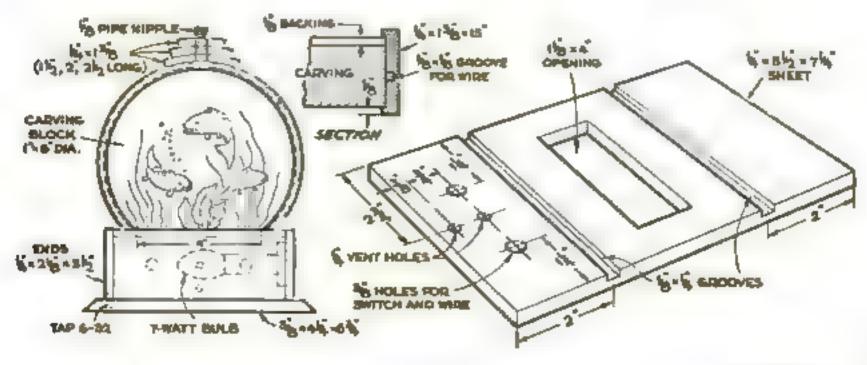
After bending the base, sand the bent edges flat and square to present a true cementing surface. Then cut the endpieces slightly oversize, cement on, and file or sand flush with the body after the joint is firm.

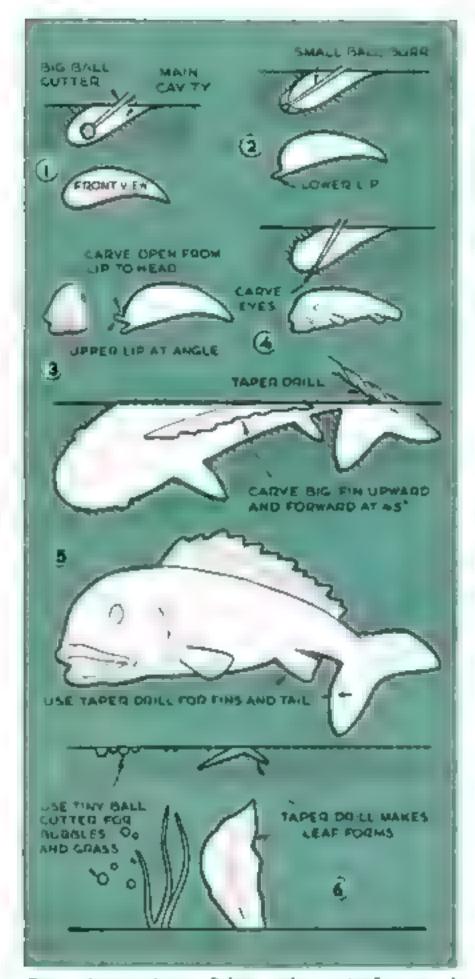


A 7-watt bulb in the base edge-lights the carving, which emits a soft, diffused night light.

Tap the edges of the base for the 6-32 screws that hold the bottom. Don't cement on the bottom; it must be removable to allow replacement of the bulb.

The ring that frames the carving is %" by 1%" by 15" black acrylic. On a circular saw, groove it 1/16" by 1%" to take the 1" thick carving block and a %" backing. A light blue or green plastic backing is suitable. Next cut the %" by %" channel for the wire in the bottom of the groove. The sec-

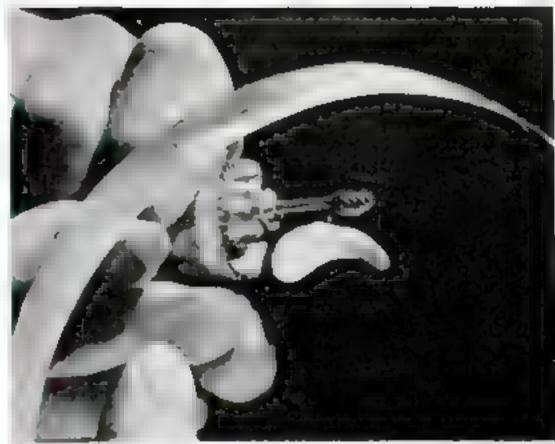




Steps in carving a fish are shown in front and sectional views. Lip contours flow into curve of head from one side to the other

tional view shows the grooves and the carving with the backing in place

Cut and polish the three smaller blocks and cement them to the top of the frame. If you prefer the longer step effect in the photo rather than the more compact one in the drawing, make them 2", 3", and 4" long. Place the frame assembly in an oven and heat to between 250° and 300°. When it is pliable, bend it around the circular carving piece, centering the three blocks at the top and trimming the ends to hook onto the 4" wide flat on the carving, drill it slightly



First step is hollowing main cavity with big ball cutter. Since hips and tail will add to its apparent length, don't overextend it.



Tail is carved with a downward sweep as shown in step 5 of the drawings at left. A tapered drill is used for this and all the fins.

undersize for a 1" section of %" pipe nipple, and then turn the nipple in carefully to cut its own threads.

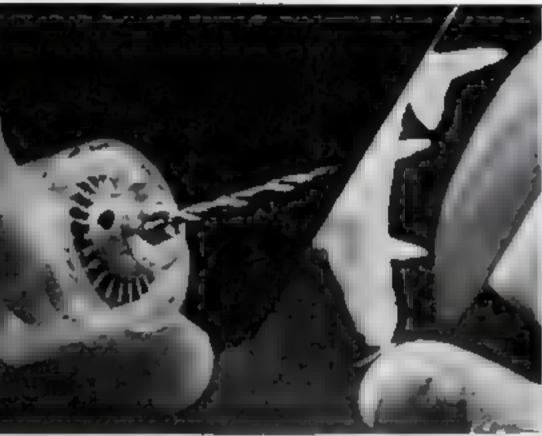
The shade is %" white translucent Plexiglas. Use a 3/32" drill to make the holes for the black plastic stitching. Cement the shade parts together and then stitch them. The four crossarms also are %" white translucent plastic, half-lapped where they meet and notched at the ends to fit under small blocks cemented to the shade panels. A %" by %" by %" block of clear plastic is drilled to take the lampshade harp and cemented in the center of the crossarms. The finial is a



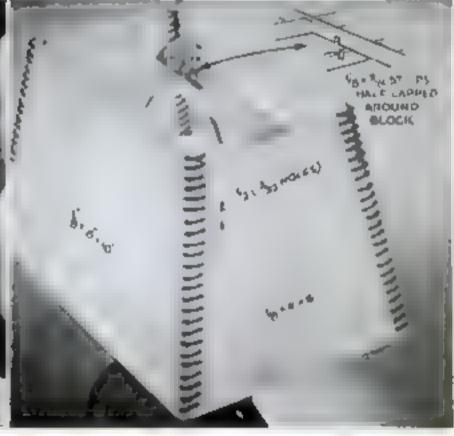
Tiny ball burr is used for lips. Lower hip is extension of bottom body line; upper hip is slanted and head is hollowed out toward it



To form top fin, drill is swept sidewise at 45° angle at ng top of body. Crests or points are formed by smoothneous in-and-out motion



Edge-on view of the work shows sweep of main body eavity and toil as seen from above front half of body is wholly inside the plastic



Top edges of shade panels are 2" shorter than bottom. Finial is plastic block, beveled into gentike form and buffed to a high polish

clear block of %" by 1" by 1" that is tapped %"-20, beveled, and polished.

Although the fish vary slightly, the same carving techniques apply to all. Before carving them, lay out the designs with India ink or china-marking erayon. With a pear-shaped burr or ball burr, carve out the bodies (PS, Aug. '47, p. 160). A small ball burr will make the mouths. Use a taper drill for the tails and fins. Scales may be simulated with the ball drill or an end mill.

Note that the body curves in two planes, the head being wholly within the block while the tail cavity breaks out of the back tional carving drawings on p. 186. The lower lip is level with the bottom line of the body, and the upper one is carved at an angle to it. Round out the curve from top of the head to upper lip. The top fin is not carved straight up but is slanted at an angle of about 45°.

When the carving is completed, place it and the backing in the frame with the lamp cord in place. Cement the assembly into the base. Screw on the bottom and then attach the shade. All parts should be cleaned and waxed before assembly.





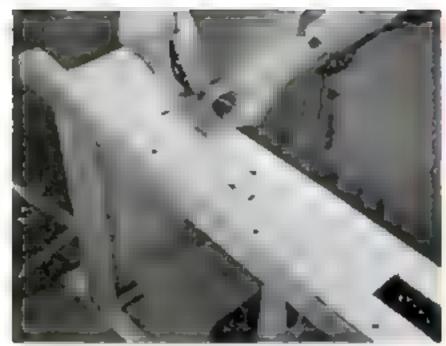
Out where the ants and butterfites roum, Popwheps up a fast meal, Indoors, at left, he uses the same unit as a portable workbench

By Acthur C. Miller

INDOORS or out, you'll find this rolling utility table an all round work horse. During the winter, you can use it as a workshop tible, kitchen table or snack server in warm months, it can be trundled outdoors. Its electrical connection may be used either to prepare meals or power a hand grude drill or soldering iron

The table can be built with hand tools but you'll save time by having a lumber yard cut out the 4" plywood sides and ends if ou don't have a circular saw. Drawers usually tricky construction jobs—are no problem here. The two used in the table are dime-store cutlery holders with plywood facing and knobs added.

Butt joints, held by 2 mel front and reinforced with waterproof glue, are used throughout the frame. You'll need 16 angle front and two 16' lengths of two-by-two



Slots for drawers are cut out with keyhole saw after starting holes are drilled. Drawers are partitioned cutlery boxes from dime store.

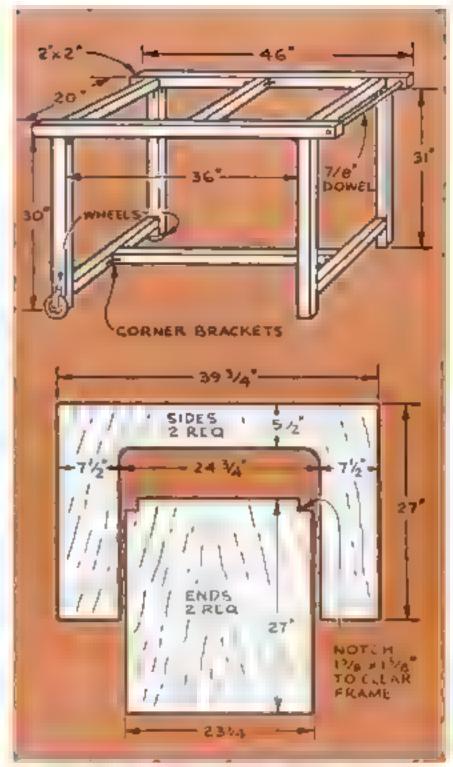


Drawer slides are 1" by 2" by 234" strips bradded to sides. Drawer guides are 3" square, Quarter-round molding can be used for guides.

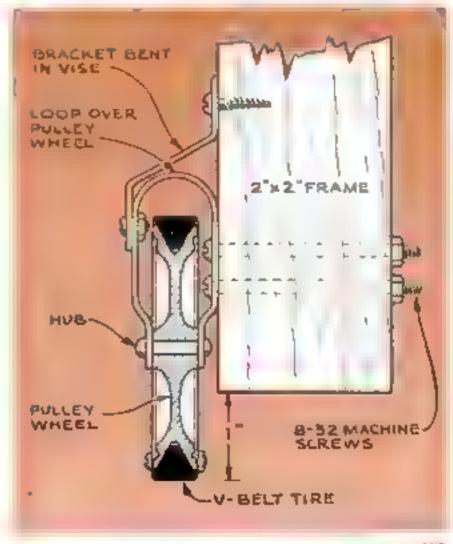
One-inch brads hold the plywood to the frame. The four shelves add rigidity to the table and also serve as storage spaces. They're sawed from 1" stock and measure 6%" by 23%". Anchor them to the sides and ends with brads through the plywood. Tack a 2%" plywood fence to the front of each shelf to keep things from falling out when the table is moved.

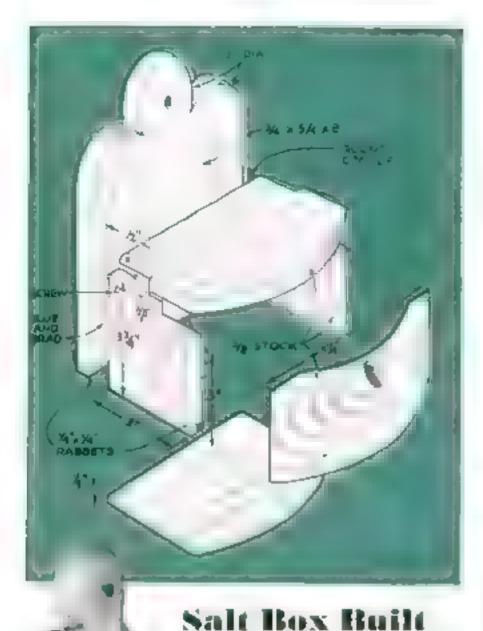
The wheels are 5%" clothesline pulleys with V belting for tires. To hold the belting in the rim, drill two holes through the side of the rim and through the two ends of the belting. Pass 6-32 machine screws through and lock them with nuts.

Boards for the top are 1" pine 42%" long. The handle bar can be a 1" dowel or a piece of broomstick. Beneath one end of the bar is a twin outlet box wired to 25' of heavy-duty cord. Two clothes hooks, mounted as shown in the photos on the opposite page, are used to store the cord.



Frame and plywood panels are shown above. Method of attaching clothesline-pulley wheels to two legs of table is detailed in drawing below.





PARTS of an old of the stock needed to build this copy of an Early American salt box Outside the kitchen.

of Scrap Wood

it'll hold gloves, keys, or eigarettes. You can build it with hand tools by altering the design to a straight front and a butt joint at the bottom instead of the rabbet.

Bandsaw the curved front and smooth the faces on a drum sander. The shallow finger recess for lifting the lid also may be sanded to shape. One of the pleasing features of this project is the simple screw hinge. Use roundheaded brass or blued screws about 1" long. Drill the holes through the sides and into the lid while the lid is clamped in place. Note that the top of the lid's rear edge is rounded to prevent binding against the back when opened.

All joints are glued and bradded. The brads are countersunk and the holes filled with composition wood before final sanding. Two coats of orange shellac topped off by two coats of paste wax complete the job. Apply the wax with No. 00 steel wood and polish the box thoroughly.—Norbert Engels, South Bend, Ind.

Rod Aids Bike Beginner

Lors of spills can be avoided if a beginner bike rider is steaded by an adult with a broomstick as shown in the photo. The stick is passed through the upper fork behind the seat and into the lower fork beside the sprocket. If the stick is



too large to fit the lower fork, whittle it down until it's a snug fit. A few lessons like this and the young rider will be on his own.—

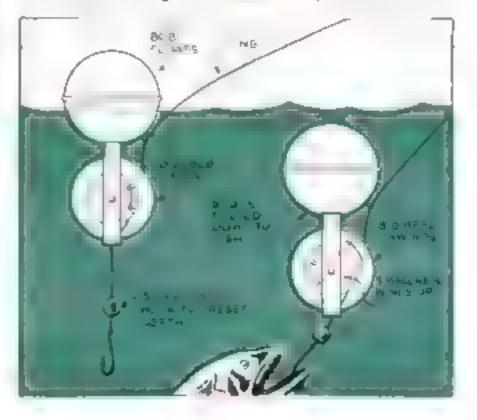
John Eckhoff, Jamaica, N. Y

Bobber Goes Down to Fish

WITH the Deep-O-Bob® you can cust and still-fish at the same time. The brass and aluminum bob has a double reel-one large and one small. Cast out with a rod or hand line, it automatically releases the hook to any preset depth down to 18'. Due to the different ratio of the two spools, the bobber automatically goes down to the fish as soon as he takes the



hook This results in a tight line at all times. The harder the pull, the faster the bob will wind itself down to the fish. Deep-O-Bob is finished in white and red. Retail price is about \$2 from J. F. Cottler Co., Oak Park, Ill.

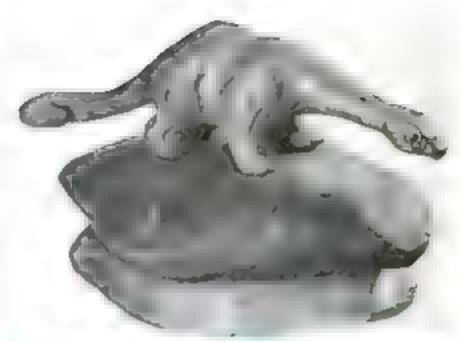


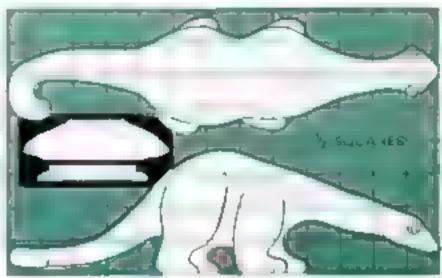
Brontosaurus Guards Desk Box

ONE of the largest of the dinosaurs, the brontosaurus, is carved in miniature to decorate this utility desk box. The recessed base holds cellulose tape and thumbtacks.

I used 2" redwood with the grain running the length of the figure. This wood carves easily and needs only a coat of shellae to finish it. Lay out the figure and cut away much of the wood along the back and under the neck with a coping saw. Carve the figure to give it a pudgy, well-rounded look. Remove wood from between the legs with a drill and finish by carving. Sand the figure smooth. The eyes are white map pins set in drilled recesses. Pupils, lips, and nostrils are painted on with India ink.

Two blocks of redwood make the base. Mount the top part in a lathe and turn out the inside. Then turn the lip in the lower section and rout out the partitioned recess. The lip is only about %" high, just enough to hold the top in place on the lower part. Next step is to saw the two sections to the rough oval shape shown in the photos, and finish them by carving. Small screws through





the top and into the feet hold the figure to the flat top of the base. You can finish the box and figure with a coat of shellac or lacquer.—Elma Waltner, Hurley, S. D.



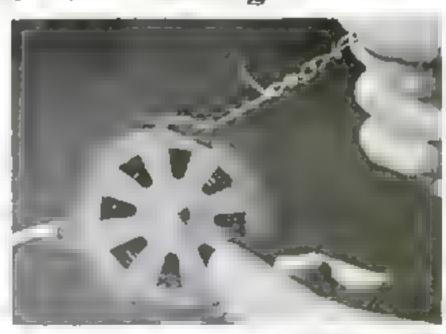
Finished box has appearance of flattened rock with small figure of dinosaur mounted on top,



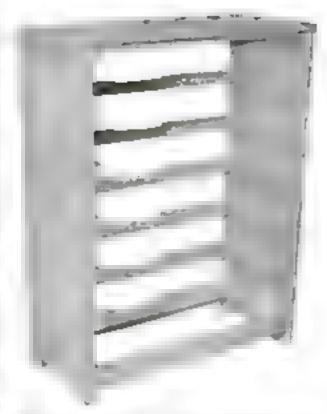
Partitioned recess in lower part of base is cut out with a router bit mounted in a drill press.

Spring-Powered Reel Does Your Fishing for You

A cost spring around the axle of the Auto-Fisher® is the muscle that sets the hook and plays the fish, according to the maker, White Bros, & Co., of Little Rock, Ark, One end of the spring is attached to the axle. The line is secured to the other end of the spring. To use the automatic fisherman, you pull as much line from the reel as you want and set the trigger in one of two notches. A cord through the eye holds the reel to a tree limb, dock, or boat. When a fish takes the bait, he trips the trigger and the spring takes over. The device is priced at about \$1.

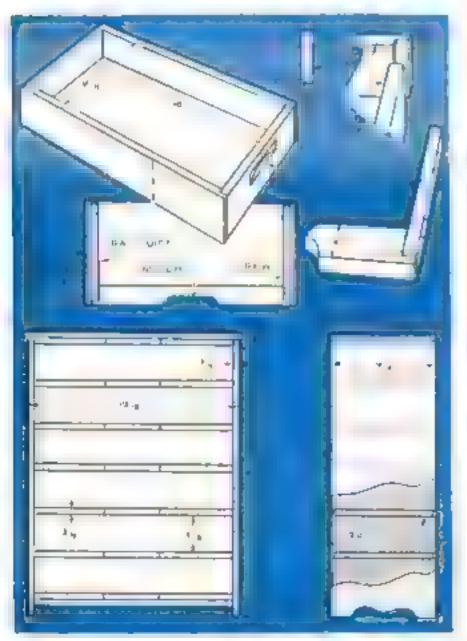






Building sets are more fun when no pieces are missing. Removable trays have side finger grips.

Photo above shows tray chest before back was installed. Tray guides are screwed to the sides.



Tray Chest Keeps Toys Together

The myriad bits and pieces of a youngster's construction set won't get scattered and lost so easily if you build him this playroom toy chest. Instead of drawers, it has six removable trays that may be slipped from the rack and carried to any part of the house. Lengthwise partitions of 1" stock divide two of the six trays.

One-mch lumber was used for the drawer guides and the top and sides of the chest. Composition board makes the tray bottoms and the back of the chest. Number 7 wood screws 1%" long hold the guides to the sides, Rabbet joints, as shown in the drawing, are used at the corners of the trays. The back also is rabbeted in, For easier carrying, grips were routed in the ends of the trays. No knobs or handles were used, giving the chest a smooth appearance. Apply glue to all joints before mailing. Stain or paint the chest.—Harold Jackson, Kankakee, Ill.

Extension on Midget Plane Gives Good Grip



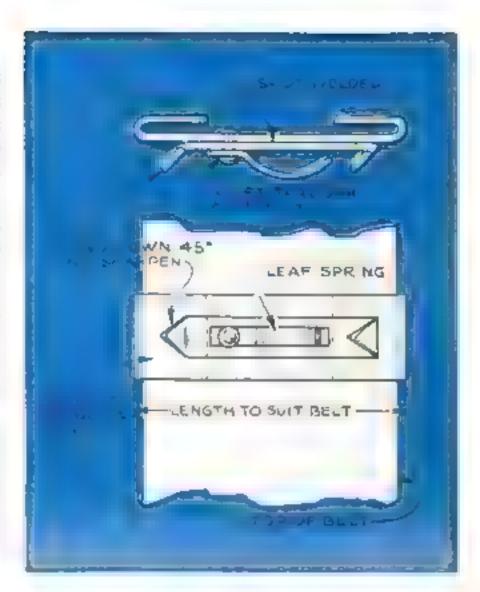
By increasing the grip area through an extension handle, this small plane does the work of a larger tool, according to the maker, Sporting Goods Specialists, New York City. The tool is 1%" wide and 5" long with a 2%" extension grip and a heat-treated, forged-steel blade. It is sold by mail only for \$1. Hobbyists and home workshoppers will find uses for this plane on numerous small jobs.

Steel Clip Aids Lineman

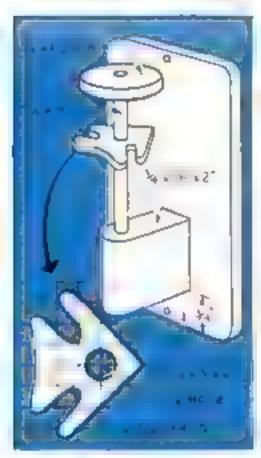
A SMALL steel clip, fitted over a lineman's climbing belt, will help prevent injury if his spikes slip. Should he start sliding, the points of the clip—mounted on the inner side of the belt—hold the belt to the pole and stop the fall.

All parts of the assembly except the spring are 16-gauge stainless steel. The chp was bent up first. The points were formed by sharpening the ends of a steel strip to chisel-like points and then bending them 45°. For strength, the strip with the points was spotwelded to the chp. Between the points, a short length of curved spring was fastened with a rivet through the assembly.

In use, the chp is set on the belt opposite the wearer. When the hueman leans back on his belt, the points are forced into the pole. When he relieves the tension on the belt, the spring releases the points.—John Burroughs, San Francisco.



Toothbrushes and Holder Protected by Tumbler



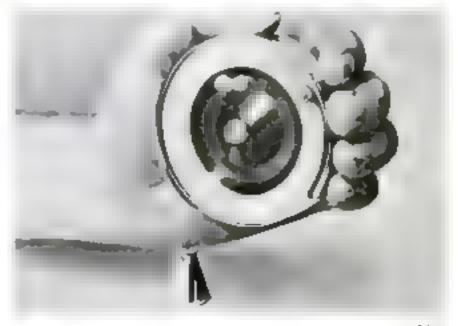
WHEN a tumbler is placed on this bracket, both your toothbrushes and their bolder are protected from dust. Cut the parts from hardwood and stain or wax them before assembly. The part that supports the dowel is attached by two countersunk wood screws through the back. Both the brush rack and tumbler support are glued in place

The entire project may be made of colored or clear plastic. One of the acrylics is ideal, Cement, of course, will have to be used to fasten the brush rack and tumbler support to the rod if plastics are used. To attach the dowel support, use two machine screws.—
Herbert C. Jones, Easton, Kan.



Reel Holds Sounding Line

WATER depths to 100' can quickly be measured with the Depthometer[®]. When the brake screw is released, a weight takes the line to the bottom and the depth is read on the line. Then the water-resistant line, marked at 1' intervals, is reeled in and the brake reset. The maker, Depthometer Co., South Bend, Ind., suggests use of the reel by boatmen in checking the location of holes, channels, and bars. The body is chrome and the brake and axle screws are brass.





Sleek scale model of the famous Douglas Skyrocket looks as if it might speed off the stand.

EXPERIMENTAL planes usually take shape first as scale models, possibly in several forms. Though ornamental, their purposes are entirely practical. By examining them, engineers can clear up many design points long before the real plane hits the air Aircraft companies call them discussion models.

Made closely to scale, these models demand the touch of an expert. And that's what you'll find in Douglas Aircraft's model shop at El Segundo, Calif., where the accompanying photos were taken. They show

how craftsmen there make a solid wood model.

Maple is a favorite material. You might be inclined to choose one of the rare woods—ebony, cherry, or tulip. But the experts say no. Their reasons are simple and practical. Such woods cost more, are harder to work to a smooth finish, and must be painted, in the end, just as any other wood Softwoods also are shunned; they bruise or break too easily.

Templates, made up from blueprints, are used to check all contours and lay out



Power tools speed up the job. While fuselage is being turned, contour is checked at intervals (left) with a template. Fuselage is held

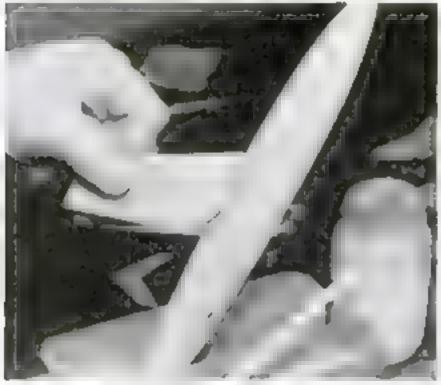
in jig (center) to drill jet exhaust ducts. At right, slots for attaching the wings and tail are cut with a slotting saw in a drill press.



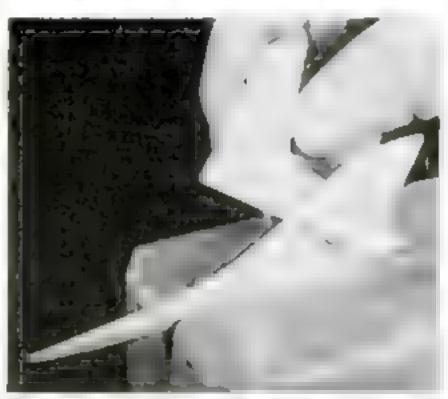
Air ducts leading to make-believe jet engine are chiseled out on bottom of model Fuse-lage was sanded smooth while still on lathe,



Roughed-out wing is dadoed as above, then cut off at the vise side of the dado. This thinned edge fits into slot already cut in fuselinge.



Wings are attached with a fast-setting glue, applied generously. They have been cut to the desired contour with a small spokeshave.



Horizontal stabilizer slips into a slot cut in vertical fin. The edges of both parts are faired off and all surfaces sanded before assembly.



A tapered nail minus its head is pressed into a drilled hole to form the needle nose. Model now begins to resemble its flying counterpart.



Alignment is checked visually before glue has had time to set. Pilot's compartment is a block of wood carved to fit fuselage.



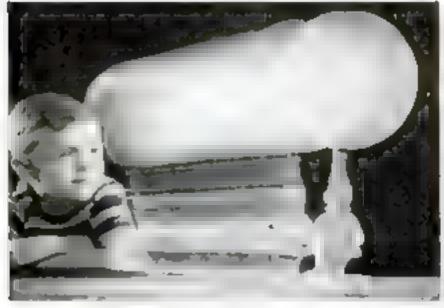
Finish coat of lacquer is sprayed on after the wood has been sanded and sealer applied. Note

that nose area is masked. This is hand painted, Waxing, decals, and a stand are final touches.

parts. The Douglas craftsmen resort to power tools whenever possible, but quite a lot of the work is done by hand with carving tools, modelmaker's tools, and the like. Thorough sanding is considered important, for this is the basis of a good finish.

Insignia decais add realism to the models. These are the same as you can obtain from a model-supply store and are also to scale. It is well to remember that both Air Force and Navy insignia go on top of the left wing, underneath the right.

Jet Balloon Propels New Toy



It's the age of jets-even in toys. Now comes a jet-propelled clown, Molded of plastic, the 7" clown has rollers on its feet, a rubber balloon on its head. Inflated and released, the balloon speeds the toy along. Hobby Model Mfg. Co., New York, makes it.

Paint Roller Holds the Paint



Write this fountain-type roller, you can forget about both brush and paint can. You simply fill the roller with any oil-base paint or enamel, and go to work. The paint seeps out through shits in the metal container and saturates a wool sleeve.

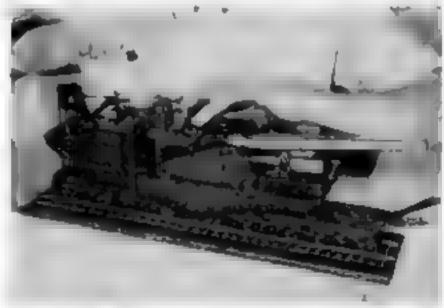
Made by the Paxtro Mfg. Co., of Detroit, the roller sells for about \$3.50. The sleeve can be removed and cleaned. Additional sleeves are available if desired.



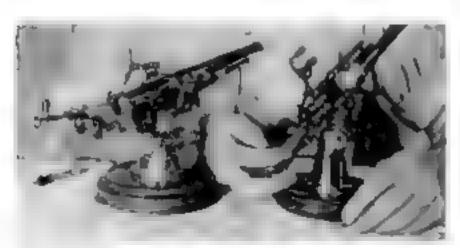
Dr. McKeen with four of his models. Replicas of baby grand pianos were carved from walnut.

Dentist Builds Super Models

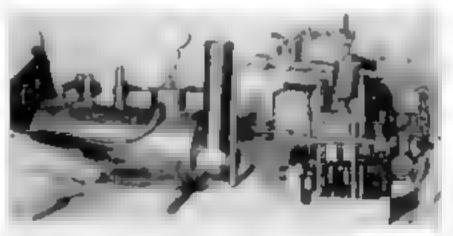
TURNING out unusual miniatures—from guns to grandfather clocks—is the hobby of Dr. Elmer McKeen, a Huntington Park, Calif., dentist. Among the models that have come from his workship to date are a scale replica of Big Bertha, Germany's World War I monster railroad cannon, tiny pianos, the boiler and engine of a tugboat, and naval guns. Music boxes in the pianos play when the keys are touched.



All mechanisms on scale model of Big Bertha operate. Flat car and gun are built of steel.

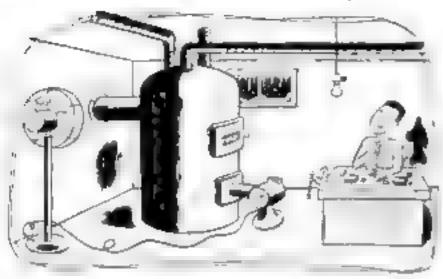


Finely machined monature Navy guns will elevate, traverse, and fire off 32-cal. blank shells.



Duplicating in detail a real tugboat boiler and engine, this model has work ng pressure of 60 lb.

What's Your Ingenuity Duotient?



Fine Heat Prevents Fin. After insulating the heater pipes in my basement, I found I had done too good a job. The basement remained downright cold, threatening me with pneumonia. But lots of heat was still going out the smoke pipe. To save some of this, I wired a fan in parallel with the oil-burner motor and set it up facing the pipe. Result: a draft of air against the hot pipe each time the burner runs, and a comfortably warm basement at all times.—Allen R. Coale, Silver Spring, Md.



Double Cooker. My breakfast consists of coffee and soft-boiled eggs. To save time, I prepare both at once, simply by dropping the prewashed eggs into the coffee after the water has risen to the top of my automatic coffee maker. The bubbling time for the coffee is exactly long enough for the eggs. When the water goes down, the grounds keep the eggs warm until I'm ready for them.—J. L. Graden, Toledo, Ohio.



Measuring Inside Out. If you can't do a job one way, you probably can another. An outside micrometer isn't much help in giving a direct reading if you want to measure the diameter of a hole. But why do it the hard way? I shape a chunk of lead into a rough, oversize ball, tap it part way in the hole, remove it—and then take the measurement on the neck of the flattened ball. It's exact.—H. P. Holland, Rockford, Ill



Let the Moles Beware! One end of a heavy concrete door step, resting on soft soil, had settled until its slope was dangerous. To raise it, I scratched a hole under it, stuffed in a deflated inner tube, and pumped up the tube. I then pushed dirt under the corners of the slab, deflated and removed the tube, and finished filling all around.—George Voris, Elmhurst, Ill.

Have you pulled off a smart one lately? We will pay for acceptable contributions showing ingenious solutions of problems in the home, shop, garage, or camp. It doesn't matter if it's wacky—if it works. Use government postcards only. Contributions connot be acknowledged or returned.



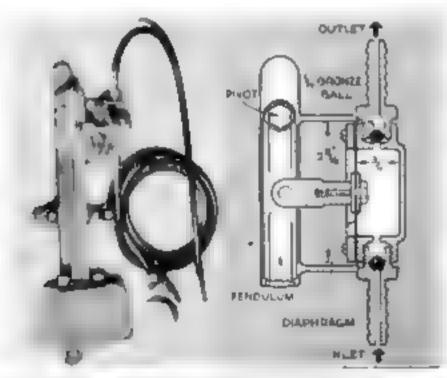


Handsome Fruit Bowl Shaped of Embossed Plastic

How fast can you drill eight holes in a board and set in short dowels? That's just about how long it will take you to make this fruit bowl. Virtually the only work done on the plastic is finishing the edges; you can do the shaping in half a minute

A sheet of embossed * Plexiglas 12" by 12" was used for the dish shown. The textured surface is on the outside. Resembling pressed glass, it doesn't show scratches. However, any acrylic sheet * to * thick can be used—either clear or colored.

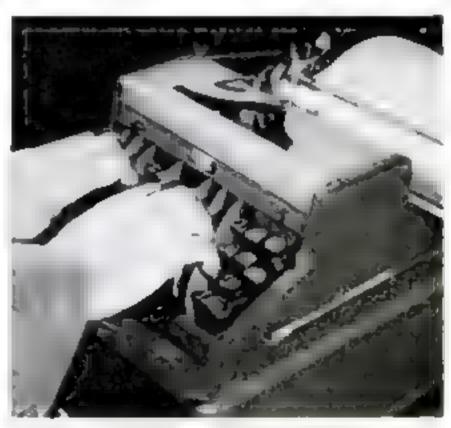
Drill holes in a wood base to the layout given, set in 2" lengths of dowel sanded smooth, and the jig is ready. After polishing the edges, heat the sheet to forming temperature in an oven set at 275°. Then, wearing gloves, center the sheet between the dowels and pull the corners through. 'Gauge them by eye to make all corners the same size. Belly all sides outward an equal amount. Press the bottom flat and allow to cool. Polish the piece with wax or antistatic material.—M. J. Moch, New York.



Rocking Boat Pumps Out Bilge

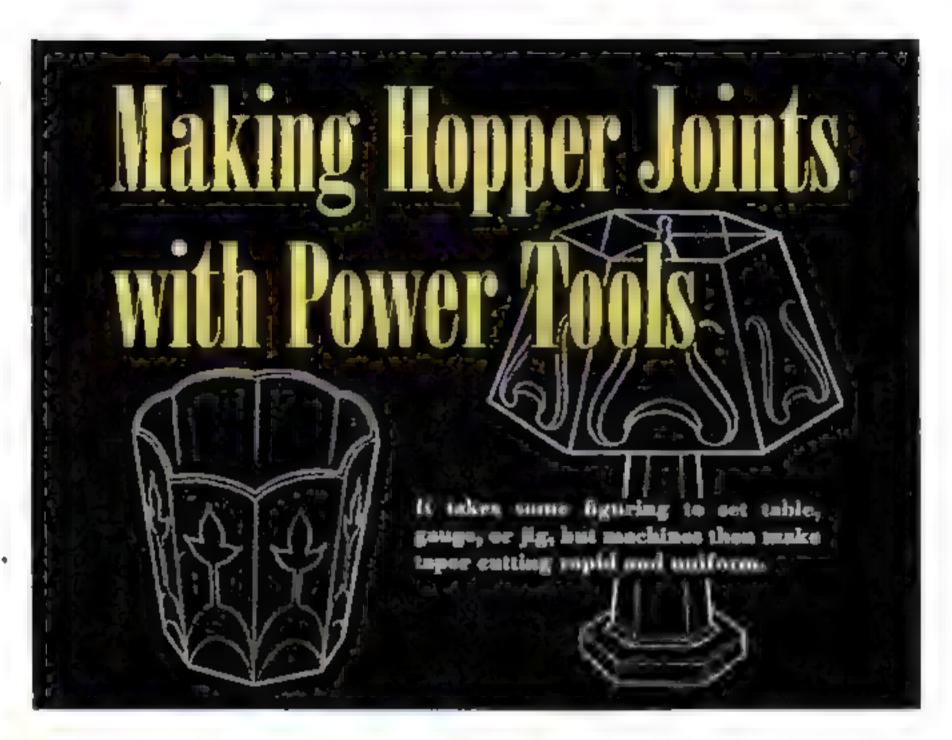
While anchored or moored in any large body of water, a boat almost always rocks. A new bilge pump takes advantage of this. Rocking of the boat causes a pendulum to swing. From it a link pushes and pulls a Neoprene® diaphragm, forcing water out through two check valves. Under average mooring conditions, the pump is said to handle about 30 gallons in 24 hours.

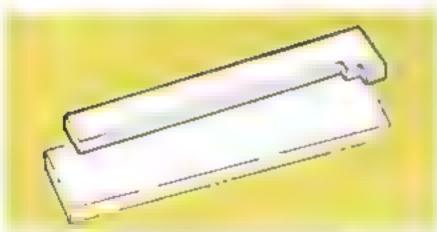
Distributed by E. J. Willis Co., New York, the pump sells for about \$22.50, including a strainer, tubing and fittings.



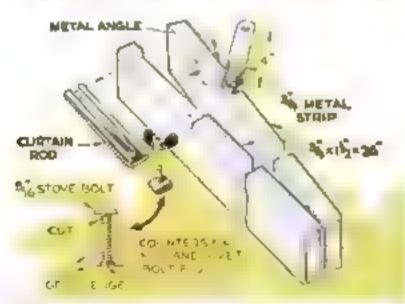
Typing Guide Helps Beginners

HERE'S a device designed to help beginners learn touch typing, invented by Russell R. Potter of New York, it consists of seven plastic strips hooked to a metal strip that attaches to the typewriter body above the keys. The strips divide the keyboard into the proper sections for each finger. This forces the student to use the correct finger on each key and also helps him develop a straight downward stroke.





1. A notched stick is the simplest kind of tapering jig However it's good only for one particular taper. Use it in production work.



2. Adjustable tapering jug can be set for any angle Calibrate the legs, in half inches, measuring from the center of the hinge pin.

By Edwin M. Love

IF YOU consider tapering as a single operation, it's easy to see how machines take the labor out of slanting the edge of a board. Set the table, fence, or gauge, and the machine does the rest. But the real advantage of power tools hes in the fact that you hardly ever want a single taper, for one-legged tables and chairs are almost as rare as one-sided boxes. In practically every tapering job you have to make a number of identical cuts. One machine setting handles them all.

Tapers can also be cut freehand on a circular saw by following guide lines, but don't try it unless the board is large enough to keep your hands at a respectful distance from the blade. Holding devices aren't hard to make, and they speed the work.

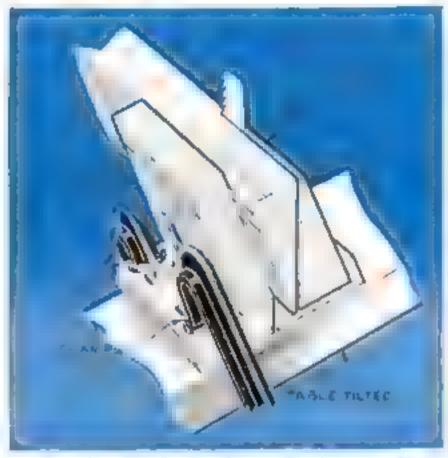
The simple tapering jig shown in Fig 1 consists of a notched stick. It's fine for production work but the jig detailed in Fig. 2, being adjustable, takes care of any tapering chore. Two hinged legs are spread to a selected angle by means of a metal arm Countersink one side of a nut for a 5/16" stove bolt, turn it onto the bolt, and rivet the bolt end flush. Grind the nut thin enough to



3. Adjust the saw fence and push the jig and work past the blade together. The tilted table shows that a compound miter is being cut.



4. The shaper molds the edge of a board as it cuts a light taper. Start cut at the wide end, where little stock is removed.



5. Two boards fastened in a T shape make a wedge-cutting fence for bandsaw or jigsaw. Set up to allow for the lead of the blade.



6. Jointing a taper on a long board. The board is marked off into equal sections, each approximately the length of the infeed table.



7. For a three-section board, lower the infeed table by a third of the total taper. Make three successive cuts in the order shown.

slide freely in the curtain-rod slot, Cut off the bolt head and screw on a wing nut.

Set the jig by measuring between the legs at one of the calibration marks—usually the 12" point. Adjust the saw fence to accommodate the jig and the board and push the two along the fence together (Fig. 3).

If the edge of a stave is to be jointed after being tapered, leave a little stock to be planed off in the second operation. When long boards are to be tapered, screw a longer auxiliary fence to the regular fence.

Just like plain ripping, tapering can be done with a bandsaw or jigsaw. If the machine lacks a metal fence, clamp a wooden one to the table. Be sure to make allowance if the blade tends to lead to one side.

For slight tapers it's hard to beat a shaper because it joints as it cuts (Fig. 4). Since the jig and work must pass between the fence and the cutter, the regular fence can't be used. Clamp a strip of wood to the table.

A T shaped fence (Fig. 5) is used for ripping strips of wedge section on a bandsaw or jigsaw. The bandsaw will cut the thickest stock of any power tool; use the widest blade available to help keep the kerf straight. Tilt the table and saw about half-way down the length of the jig to position the blade. Hold the work against the fence and push it into the blade.

The same job can be done without a jig on a circular saw by tilting the table, and then adjusting the regular fence close to the blade. The work must be held against the fence, so use the splitter to keep the wood from binding.

The method of tapering a board on a jointer is shown in Figs. 6 and 7. Divide the board into two, three, or more equal sections, each approximately the length of the infeed table. One divided into two stages is tapered in two steps. The inner table is

8. Tapering a table leg on a jointer using an extension table. Here a second pass is being made to clean up an already tapered side.





9. End of the topering stroke. A push stick is used for safety. The piece is stopped by a block clamped to the far end of the table.

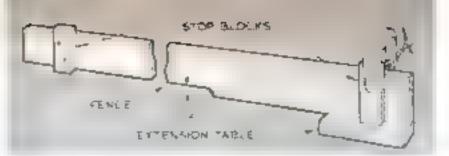
lowered one half the total taper. The near section is cut first and the second cut is continued through the first. If an extension table is built for the jointer, a long board can be tapered in one pass.

The jointer tapers square table legs nicely. Since the taper is usually slight and it is handy to make one pass per side, an extension table should be used. A kick block attached to the extension eases the start of the cut and helps gauge position.

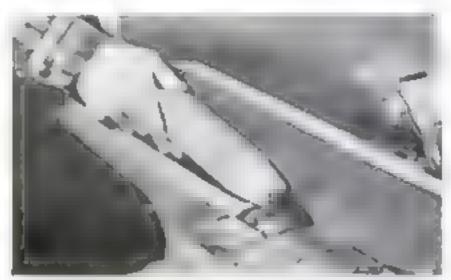
Figures 8 and 9 illustrate the tapering of a leg on which a foot is left. The start of the cut demands a kick block, while a stop at the far end prevents cutting into the foot. The long extension fence detailed in Fig. 10 carries its own extension table and stop blocks.

The first step in forming the leg is to taper the feet. Tack a block to the side being tapered at a point where the block will rest on the outfeed table while the end of the leg rests on the infeed table. A steady backward pull does the rest (Fig. 11). Even though there's a good hold, use a kick block.

A dull blade or wood that splinters easily calls for precuting the coves at the top of



10. Extension fence for one-pass tapering on a jointer is screwed to the machine fence. The stops can be either screwed or clamped on



11. In forming a leg, taper the foot first. A block tacked to the work rests on the outfeed table and supports the piece at correct slope.

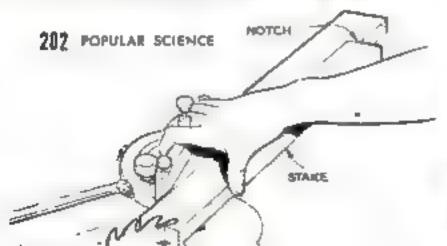
the foot. Do this either by sawing or by a recessing operation in which the foot is dropped over the cutter from the infeed side. Set the stop block to limit the tapering cut just short of hooking into the top of the foot.

A stake-pointing jig is shown in Fig. 12. It's simply a notched strip tapered at one end and screwed to the miter gauge. The stake or picket to be pointed is set into the jig notch and pushed past the saw. Turn the piece over to cut the other side.

Figure 13 illustrates the cutting of a compound miter for a hopper joint. There are two basic ways of arriving at the proper machine settings. The more orthodox (though not necessarily the easier way) involves the steps pictured in Fig. 14.

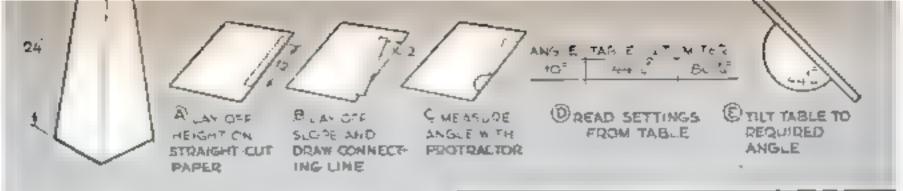
Let's assume you want a tapered column 24" high with a slope of 4". First step is to calculate the angle represented by a slope of 4" in 24". One method of doing this is illustrated in steps A, B, and C. The figures are reduced to more manageable units of 2" and 12"—the angle being the same. On a straight-edge board or paper carefully lay off the height and slope. Draw the diagonal and

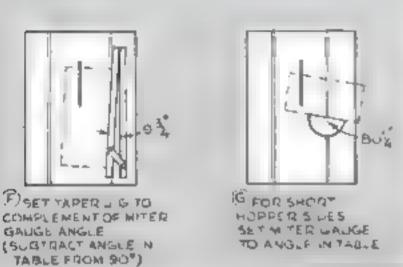
12. Stake-pointing jig is a notched stick. Set miter gauge at 45. For convenience, the gauge is pushed backward past the saw.



13. In compound mater the miter gauge (or tapering pg) is set for the face slope and the table is tilted for bevel through the thickness.







14. Given the dimensions shown at upper left saw and index settings can be arrived at by these steps. Beatlags are taken from table

measure the angle with a pretractor. In this

Refer to 1 dde 15, which shows that the saw table must be tilted to 444 (Step E) This assumes that the falt scale is at 90° when level. The table also gaves the inition-gauge setting for the same cut but in a long celman it may prove difficult to use the nater gauge. This is where the adastable taper aget Lig 2 corres in landy again. It can be set to bear against the long edge. Since it slides against a fence at 90° to the normal miter position, set it to the complement of the gauge angle (Step F), Fig. 3 shows a compound miter being cut with the aid of the jig. For short hopper sides you can use the miter gauge, setting it directly from the table (Step G).

There's another method that may be simpler. Forget all about the table and proceed to lay out the work as you would if you were going to saw the stock by hand. Procedures were given in detail last month (PS, Aug. '49, p. 192) and are summarized in Fig. 16.

Step A (Fig. 16) shows how to measure and mark the length and end angle with a framing square. Square the end-bevel line across the face of the work (Step B). Slope of the sides is marked off as in Step C.

Set a bevel square against the angle determined in A, and tilt the saw table or arbor to a corresponding angle. You can then saw the top and bottom bevels, as in C1, by guiding against the rip fence. If the bevel is on the end of a column side, use a miter gauge in the square position. Since the beveled

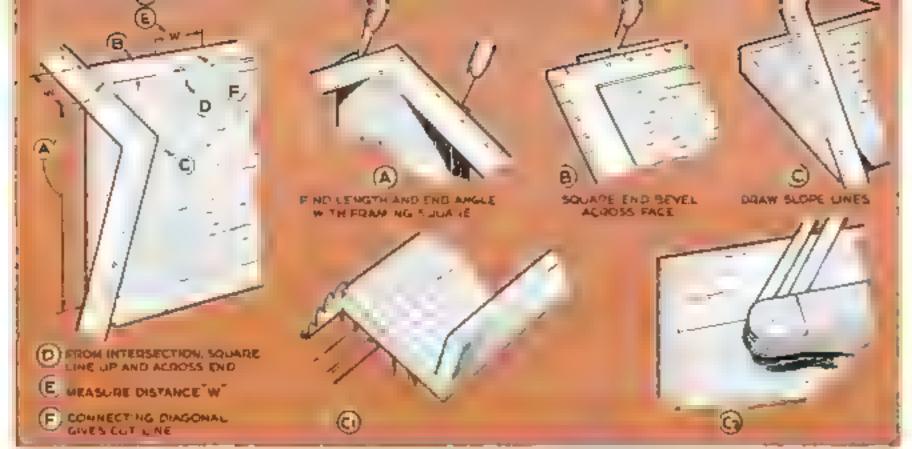
TABLE OF COMPOUND MITERS (To negres) quarter-degree)										
<u> </u>	SQU	ARE		GON	OCTAGON					
Jagle	Tih	Mrter Gauge	Tile:	Miter Gouge	Tile	Miter Gauge				
2	45	88 1/2	30	89 174	22 1/4	89 1/2				
. 4	443 4	86	29 3 4	88 1 4	22 1/4	88 1/2				
6	44 374	84 1/2	29 3 4	87	22 1, 4	87 3/4				
8	44 1/2	82 1 4	29 2	85 3/4	22	86 3/4				
10	44 174	80 174	29 1 2	84 1/2	22	86				
12	44	78 1 2	29 1, 4	83 174	21 3/4	85 1/4				
14	43 1 2	76 1 4	29	82 1/4	21 3/4	84 1/2				
16	43	74 1/2	29	81 1/4	21 1/2	83 3/4				
18	42 1 /2	72 3 4	28 1 2	80 174	21 1/4	82 3/4				
20	41 3 4	71.174	2B 1 4	79	21	82 1/4				
22	41.174	89 1 2	27 3 4	78	20 3/4	81 1/2				
24	40 1/4	67 3/4	27 1/2	77	20 1/2	80 3/4				
26	39 1/4	66	27	76	20 1/4	79 3/4				
28	38 1 2	643 4	26 1 2	75	1934	79 1/4				
30	3734	83 1 2	253 4	74	19 1/2	78 1 2				
35	36 3 4	62	25	73	19	77 3, 4				
34	35 3 4	60 1 2	243.4	72	18 1/2	77 1/4				
36	34 1 2	59 374	23 3 4	71 1/2	18	7612				
3.8	33 1 2	58 374	23	71	12 1/2	753/4				
40	32 1 2	57 1 2	22 4	69 1, 4	17	75				
42	31 1/2	56 1 2	21 1, 4	69	16 1/2	74 1/2				
44	30 1 2	55 1 4	20 3 4	68 1 2	16	74				
46	29.1.4	54 174	20 T 4	67 3 4	151/2	73 1,4				
48	28 1 4	53 1 2	19 1 2	67	14 374	72 3 4				
50	27 1/4	52 1 2	19	66 1 4	14 174	72 1, 4				
52	253 4	5134	18	65 1 2	13 1, 2	72				
54	24 1 2	51	17	65	13	71 1/2				
56	23 1 2	50 1 4	16	44 1, 2	12 1/4	71				
. 58	22 1, 4	4934	15 1/4	64	11 3/4	70 1/2				
60	21	49 1/2	14	63 1/2	11	70 1/4				

15. Knowing the angle of slope you can read saw and miter settings directly. Settings for intermediate angles can be estimated.

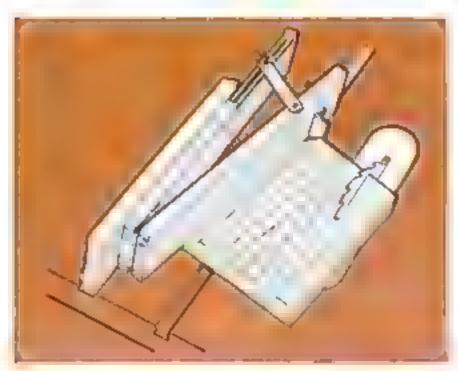
edges become horizontal when the staves are put together, the angle of the miter can be drawn directly on the bevel. In the case of a square, the angle is 45°; if it were hexagonal, it would be 60°. This angle can be marked on the beveled edge as in C2.

To cut a miter, adjust the miter gauge to correspond with one sloping line drawn on the face in C. Hold the work against the gauge head and sight along the blade of the saw at the miter marked on the top bevel. Tilt the table or arbor to bring blade into line with the miter. Take a light starting cut at the mark. If correction is needed, shift the tilt.

Once the table and gauge are set



16. For visual saw setting, mark angle on edge of wood. Full details were given last month.



17. To cut the second miter, spread the taper jug to twice the first setting. Turn it and the work end for end. Set fence above the saw.

you can cut all corresponding pieces at the same setting. Read the degree setting of the gauge, swivel it to the same setting in the opposite direction, and cut the other sides.

If you want the top and bottom edges of the hopper side to remain square, the further steps shown in D and E (Fig. 16) are taken to obtain the miter angle on a square end

Procedure for a tapered column miter follows that for a hopper side except that the tapering jig is used. It is spread to correspond with the slope line drawn on the stock and the table is tilted by sighting along the angle drawn on the end. To cut the other side, spread the jig to twice the angle. Turn both jig and board end for end (Fig 17).

FINDING ANGLES WITH A FRAMING SQUARE (WOODWORKING)

Knowing an angle and being able to copy that angle in wood are two different things. Most protractors are too small to permit angles to be copied off reliably, and a good protractor head may not always be available. A framing square, however, will usually serve the purpose nicely. The following table shows how to use one for obtaining degree settings. In all cases the reading on the blade is 12. If an angle of, say, 32° is wanted, by a straightedge from 12° on the blade to 7°2° on the tongue. The smaller angle formed by one arm and the straightedge is the desired one. To obtain an angle of 56° (the complement of 32°) use the same setting but read the larger angle. Once the angle is found on the framing square is toper ng or bevel square can be set to fit.

The table can also be used in reverse as when the lean of a hopper side is given in inches. If the slope is known to be, for example, 2½" in 12", the angle is just slightly under 12". Intermediate values can be estimated fairly closely.

TABLE OF DEGREES FOUND BY MEASUREMENTS ON PRAMING SQUARE

(Resd 12" on blade of square in all cases)

8-9ram 2 4 6	7/16+ 25/32+ 1 9/32- 1 11/16-	14 16 18 20	7 31/32- 3 7/12 3 15/16- 4 7/16	26 28 30 32	7,0000 Booffes 5 7/8 6 3/8 6 15/16- 7 1/2 8 3/204	840 40 42 44 45	Teague Rending 9 3/8 10 1/16+ 10 13/16— 11 7/12
10 12	2 3/16+ 2 9/16	22 24	4 3/4 5 11/32	34 36	8 3/32+ 8 23/32+	49	126

POPULAR SCIENCE MONTHLY SHOP DATA



Mortise Cut with Drill. Here is an adapter that brings your mortising clusel and electric drill together to form a mortising tool that's portable. Adapter and clusel can be fitted to a drill of any size in a mat

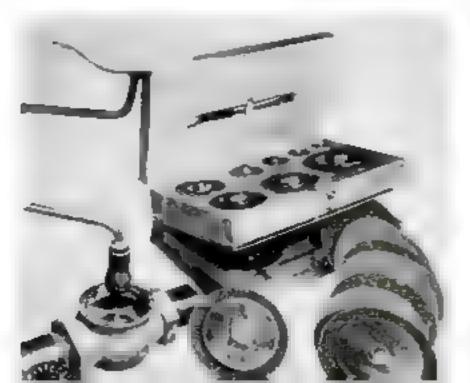
ter of seconds. The adapter can also be used on a drill press

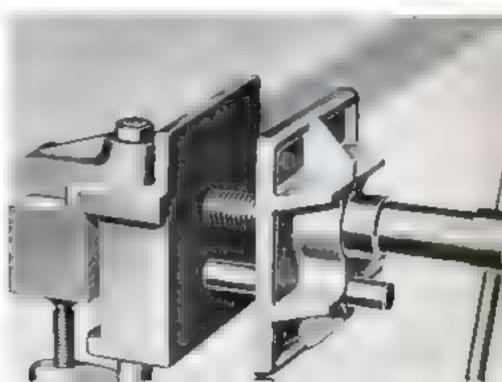
The Bertram Manufacturing Company, of Kansas City makes the adapter, which retails for approximately \$7

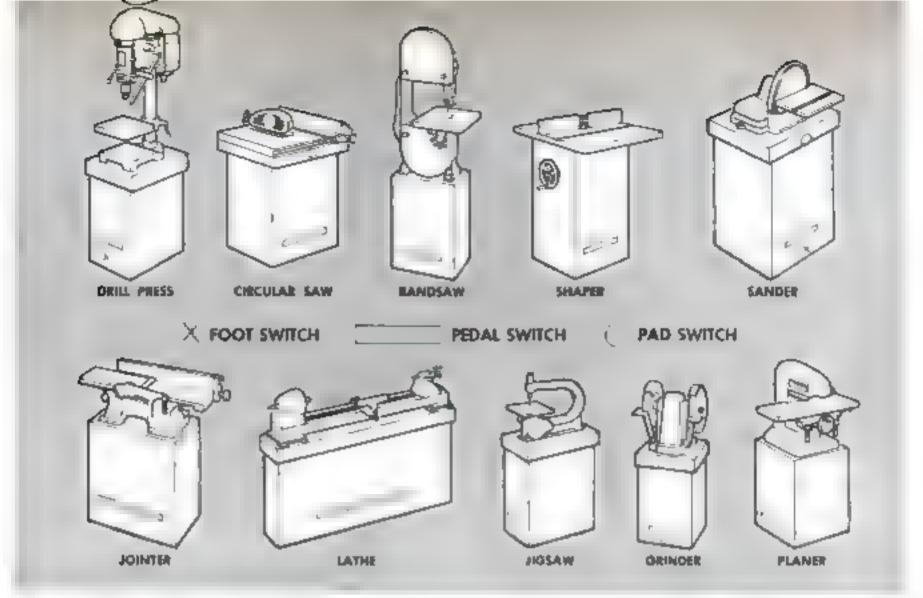
Saw Frame Itesists Twist. The frame back of this hacksaw consists of a single piece of steel tubing. The rigidity of the tubing is said to permit tightening the blade to high tension without twisting the blade or warping the frame. A cast-aluminum handle is adjustable for 10" and 12" blades. Machine Rebuilding Company, of Detroit, makes the saw. It sells for about \$4.

Disks Resent Valves. Valve and faucet reseating equipment marketed by Grace Products Co., Birmingham, Ala., uses aluminum oxide disks on a steel backing plate as the grinding material. Each unit has a coarse abrasive on one side, fine on the other. A brace or hand drill equipped with a screwdriver bit turns the disks. These can be replaced when worn. A boxed set to reseat %" to 2" valves costs about \$19.

Carry Your Vise Along. As its name suggests, the 35-lb. Porto-Vise below is designed for carrying to the job. The jaws are 4" square, open to 2%", and a steel guide keeps them aligned as the main screw turns in and out of the drilled handle. Work can be placed anywhere in the aluminum-alloy jaws—top, sides, or bottom. The mounting clamp opens to 2%". Parent Brothers, of Los Angeles, makes the vise.



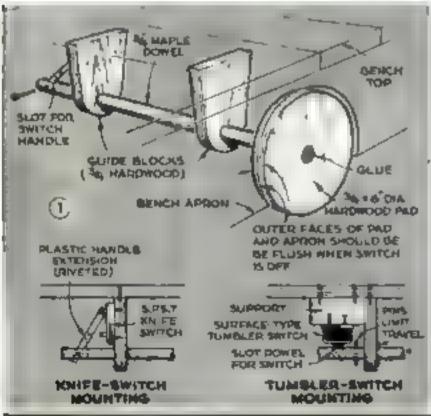




Let your own working methods determine switch type and position. Here are common ones.

Security Switches Make Power Tools Safer By Will Thomas

Pad switch is best installed on machine having a wooden face or apron. Set the pad flush with the apron so it won't be pulled accidentally.





If YOU operate small workshop machines, you must have seen how accidents begin. Maybe a drill jams, a clamp works loose, or a holder was improperly tightened. You see the accident begin, and you see it happen, but you can't prevent it. With both hands busy, you can't reach the motor switch.

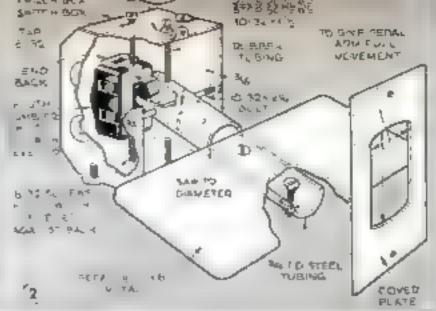
Security switches installed on shop machines enable you to turn off the power instantly without using your hands. They often prevent injury as well as damage to tools and materials. They also make your tools more efficient and easier to operate.

Security switches are actuated by foot or body. They are easy to construct and install once their principles are understood. When planning an installation, remember these five points: 1, security switches are useful chiefly on machines where the work is hand fed; 2, they should be made convenient for regular machine operation so that their use will be automatic in emergencies; 3, they must be placed where you can reach them from any normal working position; 4, they should be built or placed so that they can't be turned on accidentally; 5, don't overesti-

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Heavy-duty pedal switch can be attached to the bench by metal straps or it may be bolted on through holes in the box. Place the pedal 6"



to 1' above the floor and about 1' back from the apron. Set back, it won't be accidentally kicked up while you're making adjustments.

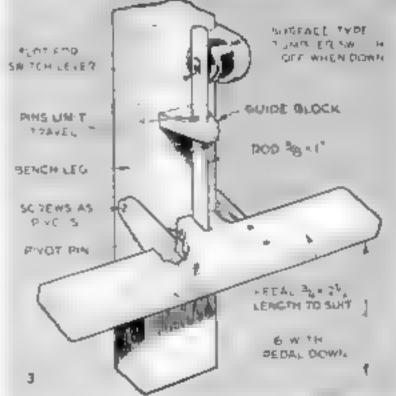
mate their value. They are not substitutes for proper guards or correct working methods. They will not prevent sudden, split-second accidents.

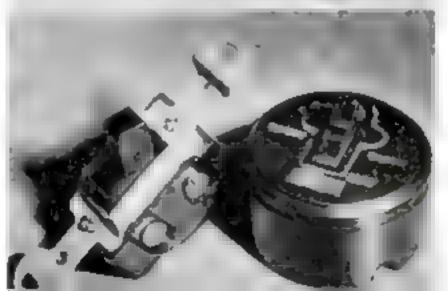
Pad-actuated switches are turned off by body pressure, so they must be placed hip or waist high. They're good only on machines that do not require you to move your body out of range during normal use. This type of switch goes best on a machine having a wooden face or apron into which the pad can be set. If the pad is flush with the apron, it won't be pulled on accidentally while you are setting up the work. It will also be protected against damage if you happen to strike it too violently in an emergency. Allow a small portion of the pad to extend below the apron, or provide a finger hole with which to turn it on. Figure 1 shows the application to both knife and tumbler switches.

Pedal-actuated security switches have the greatest range of application because pedals can be made long enough to be accessible from almost any position. Essentially this type of switch consists of a pedal held to a bench leg or frame by pivoting arms. Two typical setups are shown in Figs. 2 and 3. The heavy-duty switch of Fig. 2 is made of mexpensive metal parts; for less demanding use, the unit pictured in Fig. 3 is recommended by its ease of construction and small cost. If the rod must be made long, it is advisable to use a second guide block above the switch.

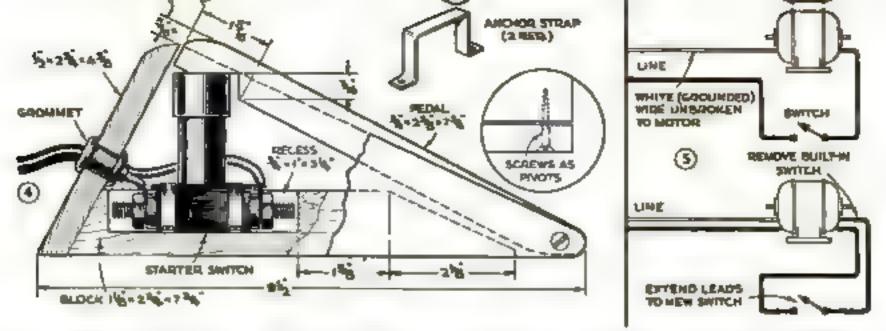
Spring-action foot switches of the normally-off type are used primarily for production work, but they also make fine security switches. You'll want this kind on machines where the power must be turned on and off frequently and where you are required to sit or stand in one position. This means that foot switches are ideal for jigSimpler pedal switch is easily made from a few pieces of wood and a tumbler switch (bottom). The pedal can be made almost any length.







SEPTEMBER 1949 707



Foot switch shouldn't be attached to floor or machine. When wiring a switch (right) break the black, "hot" lead from power source to

motor, not the grounded one. If machine has a built-in switch (lower right) it may be removed or wired in series with a security switch.

saws, granders, drill presses, sanders, and the like.

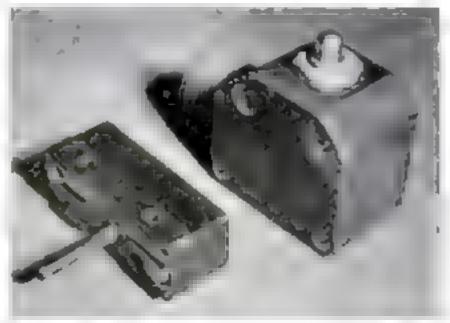
A good foot switch can be made from a starter switch picked up from an auto junk yard. Figure 4 shows how. Basically it's a box with a hinged top that serves as a turn-on pedal. The starter switch has its own spring, requires no limit-of-travel stops, and is very sturdy. A normally-off midget snap-action switch can be substituted.

It is important that the switch component be well constructed and have a current capacity at least equal to the amperage specified on the motor plate. Toggle-type float switches made for sump pumps are probably the best; tumbler switches are also good and less expensive. Knife switches are the least costly and are usually adequate. You may have to knock off the plastic handle and extend the knife by riveting to it a strip of some insulating material. Watch a knife switch for arcing. If it does are, your best bet is to replace it with a switch of the toggle or float type.

It's extremely simple to wire in a switch. Just be sure to insert it in the black, ungrounded wire from the line to the motor (Fig. 5). If the motor is plugged into an outlet instead of being wired to a junction box, use a polarized plug.

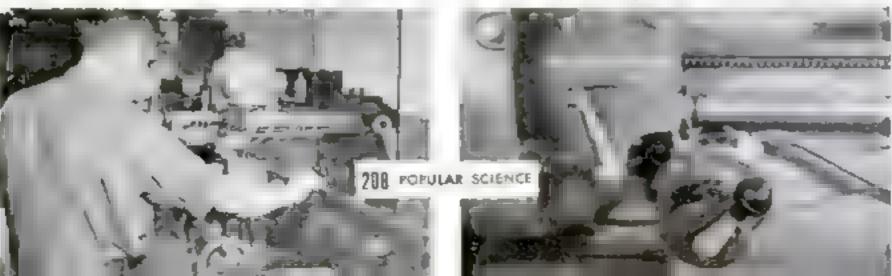


Float switch of the toggle type is expensive, but tops for use in pedal or pad switches. The metal lever simplifies installation.



Midget snap switches come in many types and housings. They re good in foot switches, but stops and pedal-return springs must be added

Motor-control rod permits the operator to stop a long lathe from any point. Rod runs in guides behind lathe to switch in back of headstock Reversing switch on metal-cutting lathe often makes security switch unnecessary. Metal lathe turns slowly, usually has automatic feed





Finished all over, the hing rest is as handsome as it is handy. Used by machinists in the last

century, it has had undeserved neglect in recent years. Above, end of work is squared up.

Filing Rest Does Small Milling Jobs

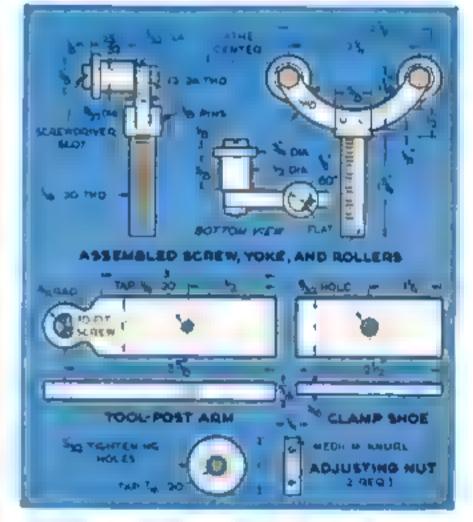
HERE'S an unusual but extremely useful lathe accessory. Set up in the compound rest in a matter of seconds, it helps you file accurate flats, squares, hexes, and other polygons on chucked work. During filing the work is locked by the indexing pin or the back gears. Even if your shop boasts a milling attachment or miller, chances are you'll prefer this rest for many jobs, since it's so quick and handy.

Dimensions given are for a popular 10" workshop lathe. If yours differs, be sure that at the lowest point of adjustment, the working surface of the rollers is at lathe center height. The roller flanges should be 1%" apart, and no part of the yoke nearer than %" to the working center of the rest.

Note that the vertical screw has a flat on it, 60° away from the slot that takes the yoke. Passing through a special hole in the compound-rest arm, the screw and its yoke will then always be at right angles to the work when the compound is locked at 60°.

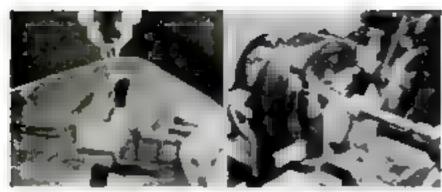
Start with the screw, machining it from %" stock. Mill or hacksaw the slot carefully, leaving it a bit undersize, thread the shank, and mill or file the flat 60° from the slot. Remove the burrs from the thread with a 7/16"-20 die, if you have one.

Lay out the yoke on X" flat steel, drill the roller-pin holes, and saw it out roughly. (Drilling a series of holes just outside the line will save hacksawing sweat.) Force the yoke into the slot, drive in a couple of pins, and bring the yoke to finished shape. A grinding wheel or aluminum oxide disk will

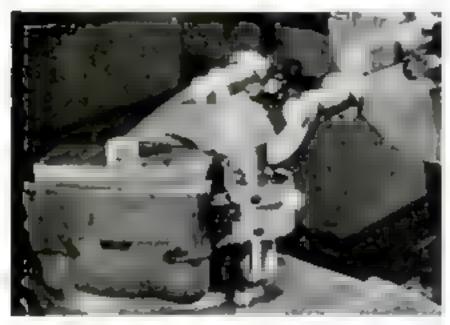




Miller slots screw to accept yoke, but hacksaw and file will do. Paradoxically, a filing rest would be a very useful aid in making itself.



Drilling around the yoke, left above, lessens the sawing job. Adjusting nuts, right above, are turned and knurled on a threaded mandrel.



Speedily set up, the rest is still capable of highly accurate shaping. The chucked work is locked stationary when a flat is being filed.

speed this job, though you'll have to file part of the inside.

For the rollers, tool steel or drill rod hardened after shaping is preferable. Turn them back to back from a piece of %" stock, drill and ream them 9/32", and cut apart. The pins and nuts are made of mild steel. With the rollers mounted, they should turn smoothly but without play or shake.

The adjusting auts are roughed from X" flat steel, drilled and tapped, and mounted on a threaded mandrel for turning and knurling. Use the lathe indexing device to spot the five equally spaced radial pin holes. Cut the clamp shoe and compound-rest plate from flat steel also. Use needle files to shape an undersize hole in the latter so that the screw with the flat slides through easily but not sloppily.

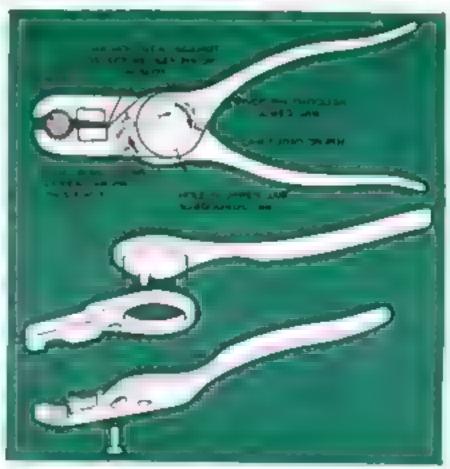
In use the rest is locked up with the rollers slightly above the desired final surface, and the work is filed until the file stops cutting. The nuts are then adjusted for the finish cut This can be done very accurately, since moving a nut a fifth of a turn (the distance from one hole to the next) will alter the height .010".—Will Thomas, Kenmore, N. Y.

New Compound-Action Pliers Lock onto Work

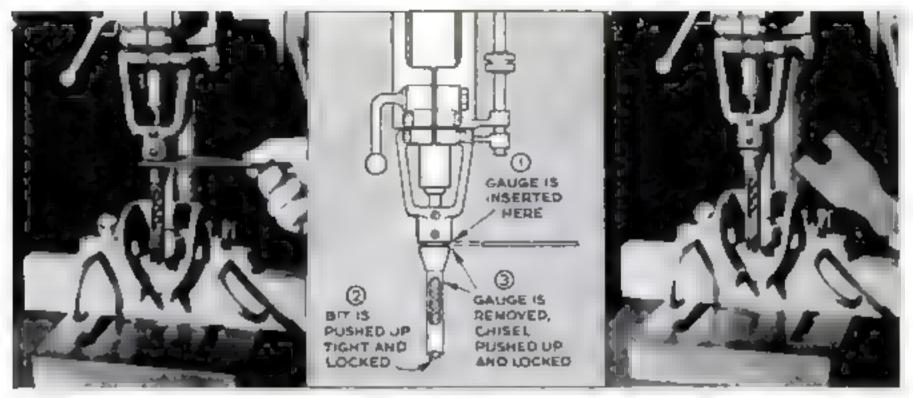


IF you close the jaws of this new pair of pliers on any solid object and squeeze the handles, the pliers will remain locked on the work like a clamp. To release the jaws, the handles must be pulled apart.

Called Lock Line® and made by the Ross Manufacturing Company, of San Francisco, the pliers are especially useful for situations



where an extra hand seems needed. A tricky compound-leverage system that uses a cam to exert pressure against one of the jaws permits application of great force. As detailed in the upper part of the drawing above, locking is secured by means of a pivot pin that is free to move and wedge in a short slot. The jaws have hardened cutter edges.



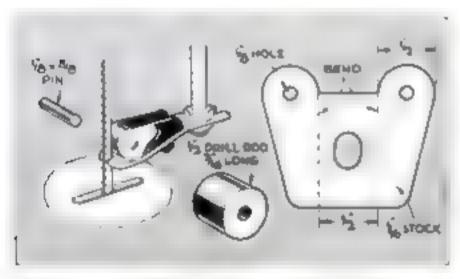
Gauge Sets Mortising Chisel to 1/16" Clearance

Mortising-chisel bits should have about 1/16" clearance between the tip and the square end of the hollow chisel. Some workers make this setting by eye, usually none too reliably. The gauge shown in use above will do it quickly and accurately.

The gauge can be cut from any 1/16" material-for instance, brass, copper, alumi-

num, or fiber. Cut a rounded notch about %" wide in the working end

To set the bit, insert the gauge between the chisel shoulder and holder (1). Then push up the bit into the hollow chisel and lock it (2). Finally, remove the gauge and move up and lock the chisel. This gives the clearance.—J. B. Leeth, Cullman, Ala.



Roller Backs Up Jigsaw Blade

IN TIME, the slotted blade guide on some jigsaws wears so deep that it serves little purpose and the teeth may be damaged by striking the sides. A roller support behind the blade will eliminate this.

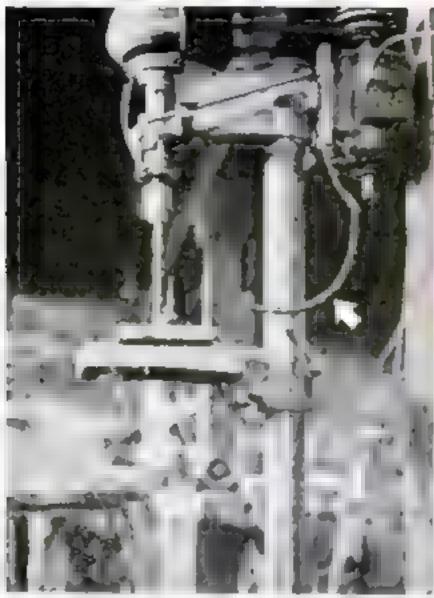
Make the roller from a 7/16" length of %" drill rod, drilling it for an axle cut from %" drill rod. Lay out a holder as shown on 1/16" sheet, bend to shape, and assemble by riveting the ends of the roller axle. Attach to the original blade guide with a 3/16" bolt. Notice that the hole for this in the holder is elongated to permit adjustment. First, set the guide so the back half of the blade rides in the slot without touching. Then bring up the roller until it just barely touches the back of blade.— Ralph S. Wilkes, Elbridge, N. Y.



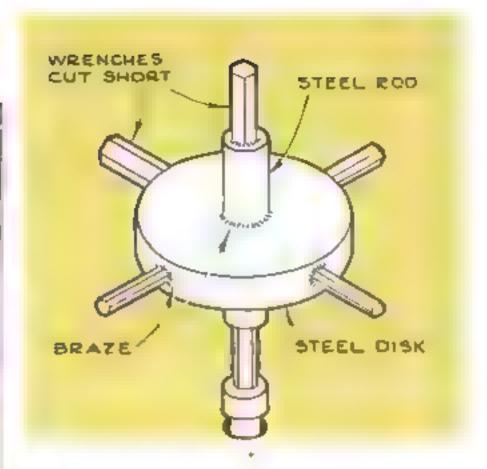
Table Has Built-in Fan

IN THE base of this round table there's a three-speed fan that circulates air throughout the room. Height and diameter of the glass-topped table are 18". The fan is powered by a 1/15 hp., 115-volt AC motor. Howard Industries, Inc., of Chicago, prices the unit at about \$55.



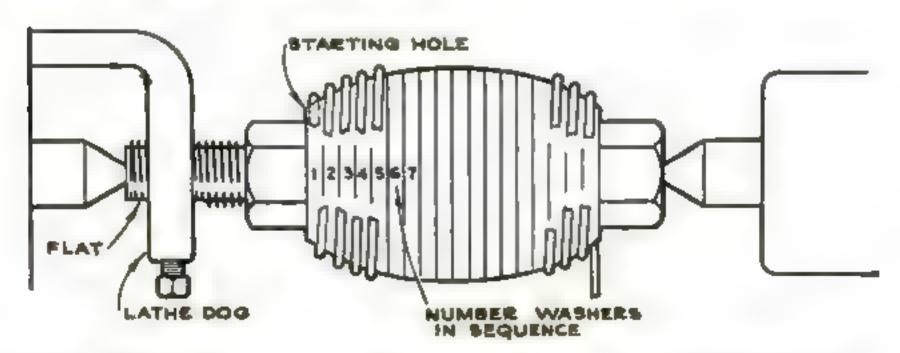


Drill-Press Chains. In our school shop we've found good use at the drill press for three lengths of light chain. One keeps the chuck key from straying, and another does the same for the cutting-oil can. The third, protected with a spring (arrow), stops the table if the clamp is carelessly loosened.—E. V. Reyner, Townsend, Mont.



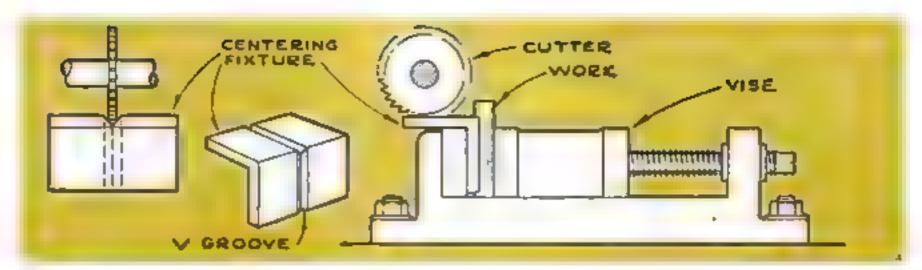
Homemade Wrench Set. If you find yourself wasting time hunting for the right wrench to fit a hollow-head cap screw or setscrew, this keep-'em-together wrench may help. It won't give as much swing in close quarters, but it will often save time.

Drill four radial holes in a steel disk, sizing each one a trifle less than the major diameter of the wrench to go in it. In a center hole braze a stub shaft having similar end holes. Cut off an wrenches close to the bend (grinding and breaking is a fast way to do this), drive them in their holes, and braze in place. If this anneals them, reharden by heating and quenching.—Clifford T. Bower, London, England.



Winds Special Springs. Here's how we turned out a batch of special oval springs. We put some big washers on a centerdrilled bolt, tightened the nut, and turned between centers to the oval shape re-

quired. The washers were numbered for reassembly, and a starting hole drilled. After winding on the spring wire in the lathe, we removed the nut and slipped out the washers.—R: E. Paquin, Worcester, Mass.



Aligns Milling Cratter. Setting up a milling machine to slot the end of a short rod ordinarily takes time and arithmetic. With this fixture it can be done just as well and much faster. It is a piece of angle steel exactly as long as the machine-vise jaws are wide, and provided with a V groove in line

on both outer faces. For a single job, clamp the angle and work together and adjust the table until the cutter touches both sides of the V notch equally. In repeat work, do this for the first piece, and with subsequent ones be sure the fixture is flush with the sides of the jaws.—H. Moore, Leeds, England.



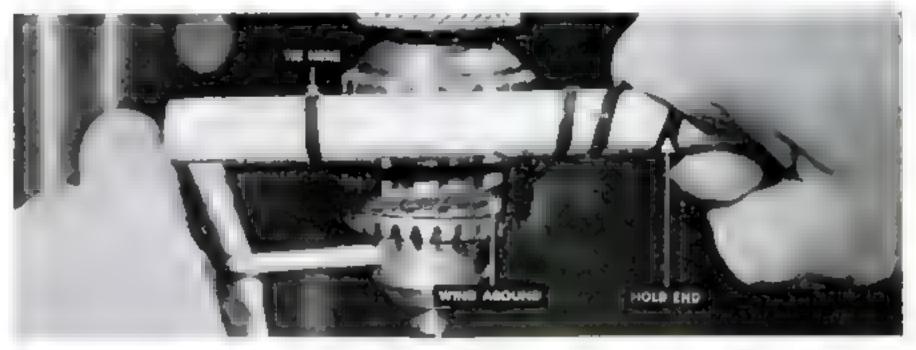
Washer Aids Olling. Ever wish you had three hands when trying to put an exact amount of oil in a spring-capped oil cup? Solder a washer %" from the tip of the spout. The washer holds back the cap while you count the number of oil drops.

Soot Shows Heat. When to start welding or "brazing" aluminum is a problem because there is no red glow at the right temperature. A good stunt, suggested by All-State Welding Alloys Co., White Plains, N. Y., is to coat the work first with soot, which disappears at about 900° F.

Hex Fix. If you've mislaid the right wrench for a hollowhead screw but have one that's too small to serve, try shimming it



out with a bit of flat steel. A ground-down piece of broken power-hacksaw blade will often do.—F. Strasser, Santiago, Chile.



Substitute Key. When you lose a chuck key and must use the chuck before getting a new key, this rig will help out. Use a 1' length of %" maple dowel, a leather thong or shoelace, and a 5/16" steel rod for the

hole in the chuck body. Wrap the thong around the chuck barrel several times and wind the free end around the dowel. Though awkward, the setup will open or close the chuck tightly enough for most purposes.



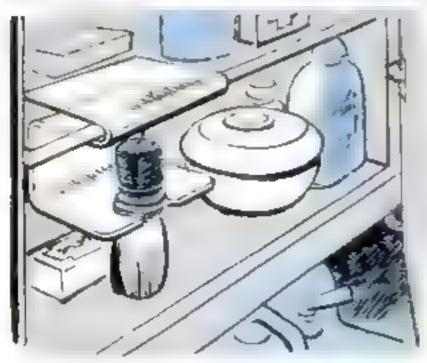
Fastening two bread pane to the inside of a closet door gives you handy receptacles for stowing wallets, keys, change, and the like when undressing or changing your clothes.



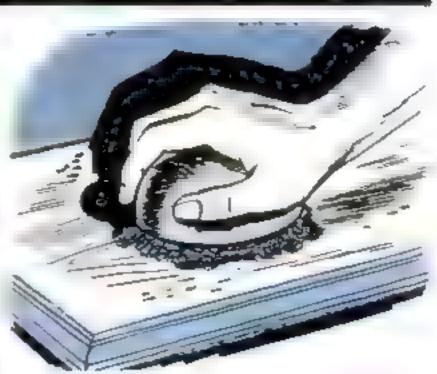
You won't have to hunt for a wiper after filling your pen if you attach a scrap of soft leather to the bottle. Punch a hole and loop a rubber band through and around the bottle



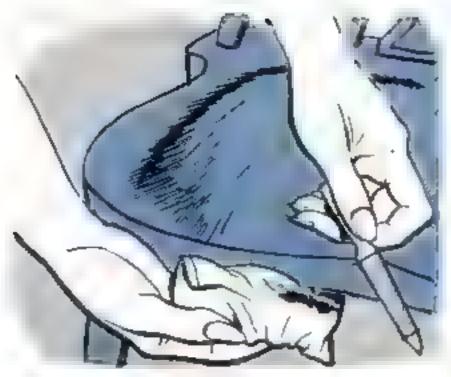
Before you start to paint a room, slip paper bags over the light fixtures and tie them in place. It's easier to keep paint splatter off them than to clean up afterward.



A plastic clip, slipped over a medicinecabinet shelf as shown, holds a shaving brush in proper drying position and helps keep the howl clear. It can also be made of sheet metal.



Half a rubber ball makes a good holder for steel wool when used like this. The rubber is the right size and shape for the hand, protecting it from steel silvers and splinters.



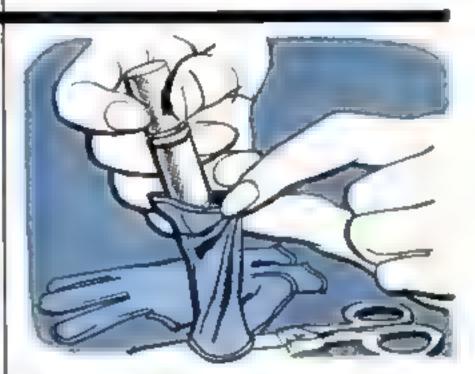
Clothes-snagging rough spots on furniture can be easily detected if you dust with an old silk garment or stocking. Keep a nail file handy to rub down any roughness you find



Before sending a garment to the cleaner, pin a note on each stain telling what caused it. Some spots need special treatment, and the note helps a cleaner pick the best one.



Hang a plastic shoe bag in the back entry as a storage place for the family's rubbers and there will be no hunting on rainy days. Name tabs may be helpful if the household is large.



To keep a shiny new lipstick case from getting scratched in your purse, make a cover for it by cutting a finger off an old leather glove. Make sure the glove is soft on the inside.



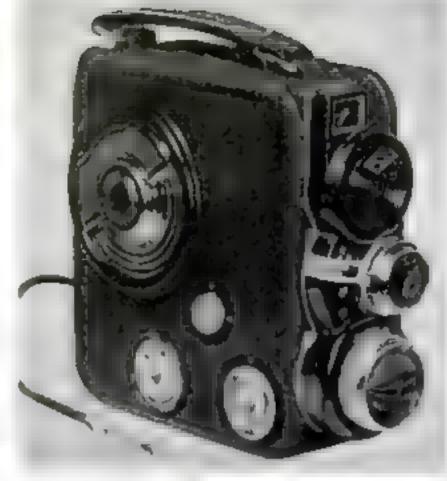
Use left-over katchen or during room wallpaper to make a set of place mats. Trun the borders

and cut 12" sections A coat of shellae will help, especially if the paper isn't washable.



Enlarger Reduces. One-to-one, or smaller, prints may be made with an Omega D-II[©] enlarger by increasing the distance from film to lens as shown in the above photo. In the top of a cardboard box, cut a hole large enough to accommodate the negative. Place the negative carrier on the box top and slip box and carrier under the condensers.—E. H. Johnson, Jr., Philadelphia.

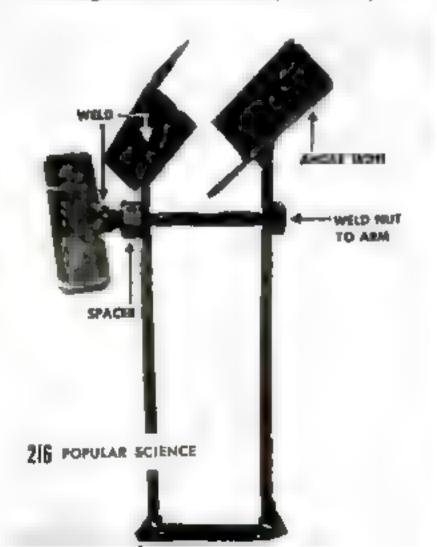
Enlarger Clamped to Pipe. When I set up my temporary darkroom, the clamp pictured below holds the enlarger to a vertical 2" pipe. The 1%" by 10" angle irons are welded to the %" by %" by 9" pieces of spring steel. On the other end, a %" by 2" by 3" plate is bolted to the enlarger. Before assembly, the arms were drilled for the %" by 4" carriage bolt.—Max Alth, Yonkers, N. Y.

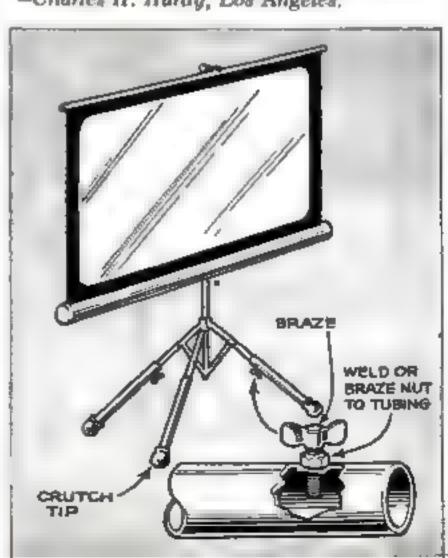


Automatic Exposure Control.

A photoelectric cell, built into the Eumig® 8-mm. movie camera, controls the shutter speed and also gives you the correct aperture setting. When you look through the view finder, you also see the pointer of the exposure meter. Centering the needle automatically sets the aperture. The distributor is the Arcap Mfg. Co., Los Angeles.

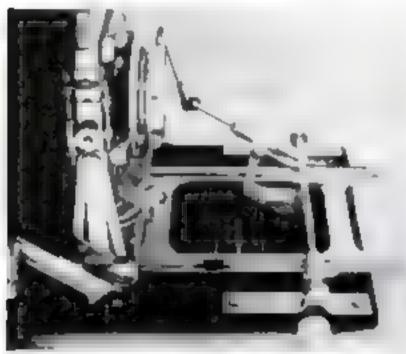
Tubing Haises Screen. Extension legs for a movie screen can be made from electrical conduit or other thin-walled metal tubing. Be sure the diameter of the tubing will fit over the screen legs. The extensions can be as long as you want. Braze or weld a 5.16" nut to the tubing to take a wing bolt. Rubber crutch tips finish the extension legs,—Charles H. Hardy, Los Angeles.





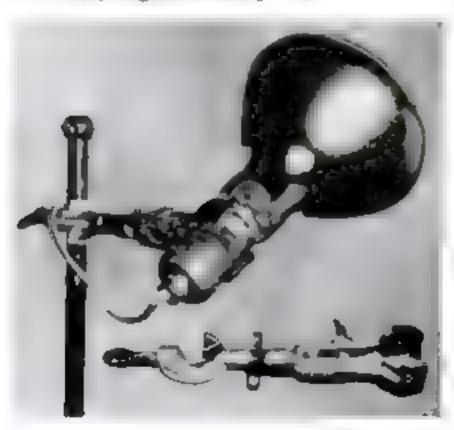


Closeup of lens mount with diaphragm-operating ring in place. Control arm has been taken off,



View across camera shows control ann. During focusing in usual way, arm adjusts diaphragm

Burette Clamp Holds Lamp. Reflector-type flood and spot bulbs can be positioned conveniently with a burette clamp. Such clamps are available at chemical supply houses, usually for less than \$1. A wing bolt holds one end to rods up to %" in diameter. Another bolt lets you swivel the jaws to any angle and lock them in that position.—Edgar S. Castle, Highland Park, N. J.





Simple to install, unit takes up small space and may be left on camera when it is closed,

Photographers who must shoot flash pictures on the run will welcome Focoflash[®]. The control need be set only once. After that, all you have to do is focus and shoot. Focusing through the range finder automatically adjusts the diaphragm for the exposure. The setting takes into account all factors involved: type of reflector, kind of flash bulb, film speed, shutter speed, and conditions of exposure—whether the subject is light, average, or dark,

The control, smaller than a pack of eigarettes, can be attached without altering the structure of the camera. The initial model fits only 4" by 5" and 34" by 44" Pacemaker Speed® and Crown Graphic® fitted with 127 mm. Kodak Ektar® lenses. The manufacturer, HCE Co., Inc., of San Francisco, plans to bring out models to fit other cameras. Focoflash retails for \$37.50.

Once installed, the unit may remain in place, since it does not interfere with closing the camera. The diaphragm-operating ring is threaded for a filter ring.

Simple Print Washer. Remove the handle of a plumber's helper and cut a hole through the rubber where the end of the



handle was. Drive four small nails in the top and slot the bottom. Placed over a sink drain, it allows the water to escape while the nails keep prints from the hole.—R. W. Breland, Colorado Springs.



Ever wonder how news photographers make prints so quickly? You can do the same—for fun or profit.

By Kenneth M. Swezey

IN PHOTOGRAPHY, speed is spelled with a dollar sign. A photo developed and printed in a matter of minutes is often worth money. If you work fast, a shot with top news value will find a welcome from your



1. Quick developing is the first step. Use of a two-solution developer as above aids control of contrast. Single solution can also be used.



2. Agitate film 5 sec. in an acetic acid bath to stop development. Above 70° F, dilute this bath to prevent blister formation on negative



5. Wipe surface water off the negative with a wad of cotton that you have wet and squeezed out. Put the neg on a ferrotype tin for this



6. For enlarging, place the wet negative in a glassless carrier or squeegee it lightly on a single glass plate with emulsion side down.

newspaper. Or perhaps you'd like to try your hand at night-club photography, snapping social groups—at dinners, parties, and the like—and delivering cash-on-the-line prints before the gathering breaks up.

Such photo-finishing demands shortcuts. You can't afford to dawdle. In newspaper darkrooms they do the job in six to ten minutes. You probably can't equal that, but you should be able to cut the time to 15 minutes or less.

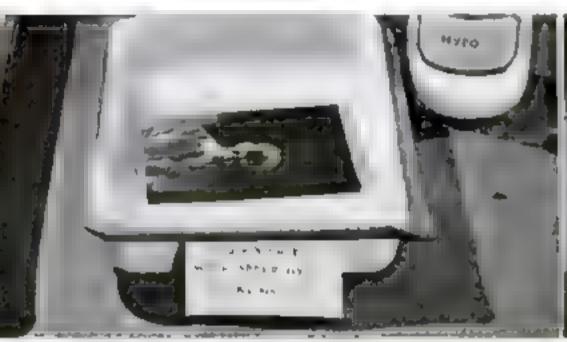
It will help, of course, to have all your equipment arranged and your solutions mixed, ready for work the second you hit the darkroom. Sheet film is most practical for rapid finishing, but there's no reason you can't get speed with roll film.

If you incline toward submitting news photos to your local newspaper, better find out first whether they'd rather have undeveloped film, negatives, contacts, or finished enlargements. Because of their superior facilities, certain of the larger papers would rather have the film.

Developers for rapid work can be either the single or two-solution variety. In a twosolution developer, the developing agents and preservative are in the first tray, the alkali in the second. Such developers have longer life and make it easier to control development. The first solution may be stored and reused repeatedly. The second should be renewed after becoming badly discolored.

Ansco recommends this formula:

Solution 1—in 24 oz. water at 125° F., dissolve 75 grains metol, 1 oz. sodium sulphite, and X oz., 35 grains hydroquinone, then add water to make 32 oz. Solution 2—



3. Add extra hypo to speed up fixing. About 4 oz. to each quart gives best results. Fix the neg for about 1% min. with constant agitation.



4. Wash for 2 min. in rapidly running water. Later if you want to preserve neg, fix for 5 or 6 min. more and wash for about 20.



7. For contact printing, sandwich wet negative between two sheets of film from which emulsion has been cleared. Squeegee lightly.



8. A dry negative can be obtained by dehydrating it chemically in a saturated solution of potassium carbonate. Immerse it 4 or 5 min.



9. Infrared bulbs will also dry a neg quickly. Set them up as above and direct fan on neg to carry off moisture and prevent overheating



10. Print can be dried quickly with a blotter and iron if an electric drier isn't available. Set iron at moderate heat and keep it moving.

in 24 oz, water at 125° F., dissolve 3% oz. sodium carbonate. To use, pour each solution into a separate tray without diluting.

In rapid processing, submerge the film quickly and evenly. Agitate the tray constantly. At 70° F., immerse the neg I minute in the first solution and an equal time in the second, without rinsing between. At 75°, immerse in each solution 45 sec.

If you prefer a single solution, Kodak Dektol® or D-72 is excellent. Use as a stock solution without dilution. At 70° develop for 1 mm., 40 sec; at 75°, 1 min., 20 sec.

After development, swish the film for 5 sec, in a short-stop bath made by dissolving 1% oz, of 28-percent acetic acid in 32 oz, water. If the temperature of the solutions is above 70° dilute the short stop with an equal amount of water to prevent blisters.

To speed up the fixing, add 4 oz, plain hypo to each 32 oz, of the regular acid hardening fixing solution. After the film has been submerged for half a minute in this fixer, it's safe to turn on the light. Continue fixing until the negative has completely cleared. This should take about 1½ min.

Next wash for 2 min, in a tray through which water is running rapidly. Then place

the negative on a clean ferrotype plate or sheet of glass and wipe off the surface,

You now have a choice of printing from the wet negative or drying it by rapid meth ods. The wet technique is faster.

For enlarging, place the wet neg in a glassless carrier or squeegee it lightly, emulsion side down, on a glass plate. For contact printing, wipe off the surface moisture and sandwich the negative between two sheets of film from which the emulsion has been cleared. Squeegee lightly to remove air bubbles. Handle all wet negs carefully, since the emulsion is soft and easily damaged. Keep exposure time to a minimum.

If you prefer a dry neg, you can dehydrate it chemically by immersing it in a saturated solution of potassium carbonate for 4 or 5 min. Make this solution by dissolving about 8 oz, potassium carbonate (salts of tartar) in 7 oz, warm water and allowing to cool,

After immersion, place the neg on a ferrotype plate and wipe the surface moisture from both sides. It will now be dry enough for printing. Wash it thoroughly later.

Two 250-watt infrared bulbs screwed into reflectors also provide a quick method of drying. Set the bulbs about 8" on either side of the neg and direct an electric fan breeze along either side to prevent overheating. Always start the fan before turning on the bulbs, leaving it on until after the lights are out. Before trusting a valuable neg to this drying method, better try it first with an old one to determine the best distances.

Negatives to be dired by artificial heat should be chemically hardened between developing and fixing. You can make a good hardener by dissolving % oz. potassium chrome alum in 16 oz. water, adding % oz. of 28-percent acetic acid, and then adding water to make 32 oz. Place the negative in this instead of the ordinary stop bath and agitate for 3 min.

Develop the prints for 1 min, in a Dektol or D-72 type of developer diluted 1 to 1. Rinse for 5 sec, in running water and fix for 1 min., with constant agitation, in a separate batch of fixer with increased hypo.

Wash for 2 min. in running water, blot off the surface water, and dry on an electric drier or put between blotters and dry with an electric iron. In using an electric drier, put blotters between the print and drier apron to keep hypo from contaminating the apron. Prints that you want to keep for any length of time should be fixed several additional minutes and washed at least 30. END



Boat Kits Designed for Home Assembly

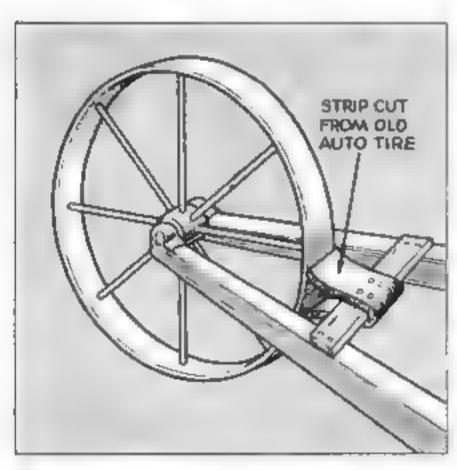
Kits of prefabricated boat parts—for craft ranging from an 8' dinghy to a 23' cabin cruiser—are offered by U-Mak-It Products, Marine Division, of New York City. Each package includes necessary screws, bolts, glue, seam compound, and basic fittings, but no ornamental hardware.

All the plywood and hardwood parts are lettered and numbered for easy assembly. Each kit includes a set of step-by-step photos that show the various stages of construction Frames and transoms come already assembled. Curved parts are supplied steamed and bent, ready to install. All rowboat plankings are cut for the full length of the boat. Transoms are of five-ply X" marine



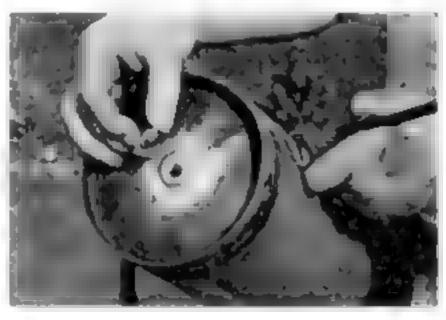
plywood and reinforced all around with hardwood.

The company also offers a line of accessories and parts such as deck fittings, propellers, shafts, and rudders as well as marine conversion parts for several automobile engines. Prices for boat kits range from \$47.50 for the dinghy to \$973 for the cruiser.



Rubber Clears Wheel of Mud

A strue cut from an old automobile tire and attached to a wheelbarrow as shown will keep the wheel free of mud. The thick rubberized cord makes a satisfactory scraper, since it is too flexible to lock the wheel.—
Edward H. Stutz, Cleveland, O.



Plug Drains Garden Sprayer

Many garden sprayers are ruined by rusting through the bottom because it's almost impossible to remove all the liquid after use. I altered my sprayer by fitting a drain plug in the bottom. To do this, drill a 7/16" hole in the center. Tap a brass or galvanized washer for a %" pipe plug and solder the washer over the hole. Use a brass or galvanized plug that has a shoulder to hold a rubber washer. The plug usually will hold pressure when only finger tight.—Clinton R. Hull, Costa Mesa, Calif.

Intercoms Save You Steps in Home, Office, Shop

Take your pick of a minimum tubeless circuit, an instant-heating battery job, or a heavy-duty AC-DC unit.

TF YOU live or work in more than a couple A of rooms, the question you may well ask yourself is not whether you need an intercom but what kind of intercom you need. These tireless servants run your errands faithfully to save you countless steps. At home they make it unnecessary to shout from cellar to attic; at work they lighten the load on telephone extensions and get your message through fast,

But granting their usefulness, it must still be admitted that no one type of intercom is suited to every job. If you have to make only one or two calls a day, you wouldn't want a set that draws current while it's idle. A battery set will give you the advantages of instant heating, and uses no stand-by power. On the other hand the cost of battery replacements may make it unwise to use this type of circuit when the intercom must be left on for long periods.

To solve a variety of intercom problems. POPULAR SCIENCE has rounded up the three



on the following pages. The first, built by Tracy Diers, of Richmond Hill, N. Y., is a three-tube, battery-powered unit. It requires no warm-up period, so calls can be made instantly from either end. Because no current is used unless a call is being made, the batteries will have long life.

The second pair, devised by William Norton, Manhattan, N. Y., consists of two identical units. It would be hard to find a simpler circuit, for each box contains only a warsurplus carbon make, a speaker, and a bat-

tery. No tubes are used.

Henry C. Martin, also of Manhattan, built the third set. It operates from an AC or DC house line and is ideal for service in which it will be turned on in the morning and off at night. After it has warmed up, calls can be made from either end just by pressing a button. In the photo at the right, above, the remote unit is shown in service as a baby tender. The master set in the shop enables



you to keep tabs on a sleeping child upstairs. Note the clock placed next to the listening box. So long as its ticking can be heard downstairs, you know the intercomis functioning.

Battery-operated Intercom

, In the three-tube circuit shown in photos and diagram on the following page, two small permanent-magnet speakers double as microphones. Power is obtained from a 67%-volt B battery and a 1%-volt hearing-aid cell.

Build the amplifier first. The model pictured was assembled on a 3x" by 4x" chassis. Three tubes and two transformers are mounted on top of the chassis, as can be seen in the photos. An 8-contact terminal strip is also placed on top to facilitate connections to batteries and the remote unit.

The amplifier should present no special wiring problems. Short leads are always desirable; all of these were made with pushback wire. Ground connections are soldered

to lugs bolted to the chassis. Use solder sparingly; a blob of it could easily short-circuit the closely spaced prongs of the miniature tube sockets.

When you have completed the wiring, you can test the amplifier by connecting the voice-coil terminals of the remote speaker to terminals 3 and 4. Press \$1 down to turn on the filaments. The amplifier should start operating immediately. Since the speakers are close together in this test, you will probably also hear a loud feedback howl. Moving the speakers farther apart reduces it.

Both the local and remote units were placed in metal boxes. The former measures 5½" by 5½" by 6½", and has two removable covers. The back cover was discarded and a piece of wire screening was fastened in its place. The front panel is then drilled to clear the shafts of \$1 and \$R7\$, and a speaker hole is cut out.

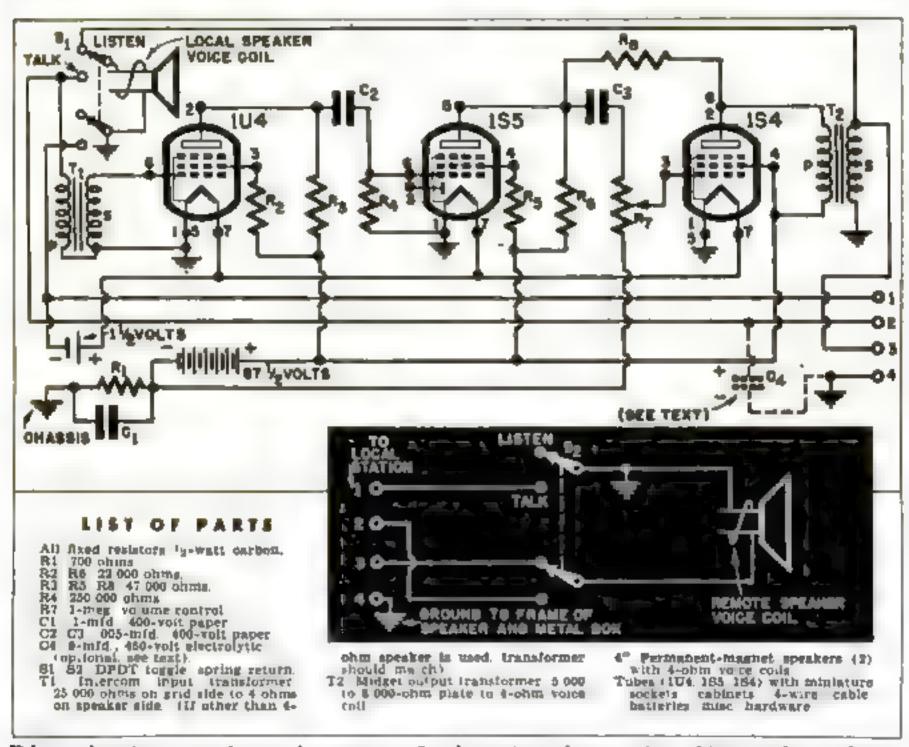
The remote box is simplicity itself. It contains only speaker, switch, and a four-



Local station is assembled on a 3%" by 4%" chassis, transformers, tubes, and terminal strips go on top. Controls are on front edge-



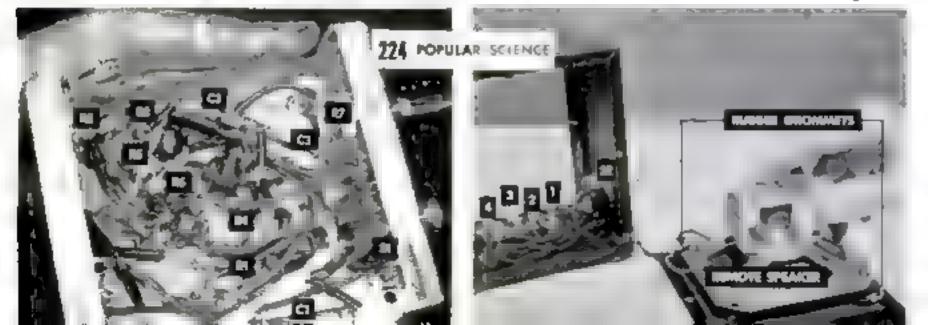
Front punel of metal box is cut for speaker and control shafts, the back cover is removed and replaced with a piece of wire screening



When planning parts layout leave space for batteries; they go in cabinet with amplifier.

Bottom view shows location of most of the Remote station contains speaker and switch small parts. Position isn't critical in this circuit but it's good to keep leads short.

Grommet mounting of speaker helps reduce hass tone that often occurs at the end of a long line



contact terminal strip housed in a 4" by 5" by 6" metal box. Stack a couple of rubber grommets or washers on the screws that hold the speaker to space it back of the panel.

Connections between the two units are best made with four-conductor intercome cable, but you can use two lengths of lamp cord. The latter, however, may cause some oscillation. Should this happen, add an 8-mfd. electrolytic condenser (C4) from terminal 2 to ground on the local unit. It's essential, of course, to connect the local-station terminals to the corresponding ones on the remote unit. With four-wire cable, the job is made easy by color-coded wires; if you use uncoded lamp cord, test each lead for continuity.

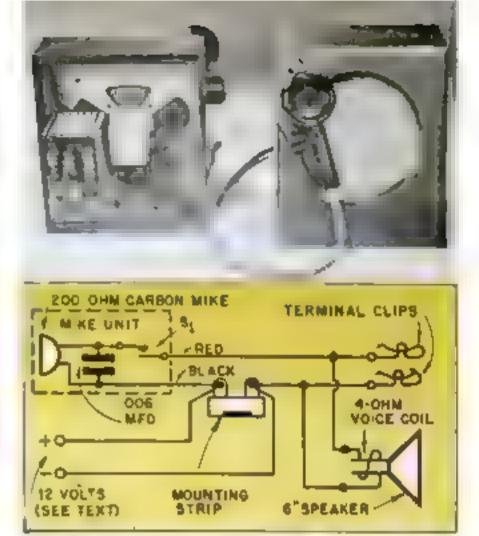
Tubeless Intercom

There are many cases, especially around the home, where an intercom would come in handy, yet the use you can get out of it doesn't justify the cost or work involved in building a high-powered job. For such light service, take a crack at the tubeless unit pictured above. It will work at distances from 50 to 100 feet. Though it isn't loud, it is clear and audible.

Two Army-surplus T-17B microphones were purchased for about a dollar apiece; each of the 6" speakers cost just a bit more than that. These items plus a pair of batteries are all you need. If you make your own cabinets, total cost won't go much above \$3 a unit. Should you have trouble obtaining the surplus mikes, use standard carbon microphones. In this case, however, reduce battery voltage to 6 to 8 volts. The army mikes have three color-coded leads. Use only the black and red ones; cut off the white. This takes advantage of the press-totalk switches in the mikes; no other switches are needed. Connect the units together with two-conductor wire attached to the terminal clips indicated in the diagram.

AC-DC Unit

An amplifier circuit similar to that used in small record players provides the muscle for this two-tube squawk box. Special coupling transformers and a switching arrangement again allow ordinary permanent-magnet speakers to double as microphones. The speaker-to-grid matching transformer, T1, couples the Alnico® speakers to the input of the amplifier. Primary impedance matches that of the voice coils (in this case, 4 ohms). Secondary impedance should be as high as



Simple intercom needs only mike, speaker, and battery. Parts enclosed in dotted line in diagram are included in surplus T-17B mike.

possible. In the unit shown it is 106,000 ohms.

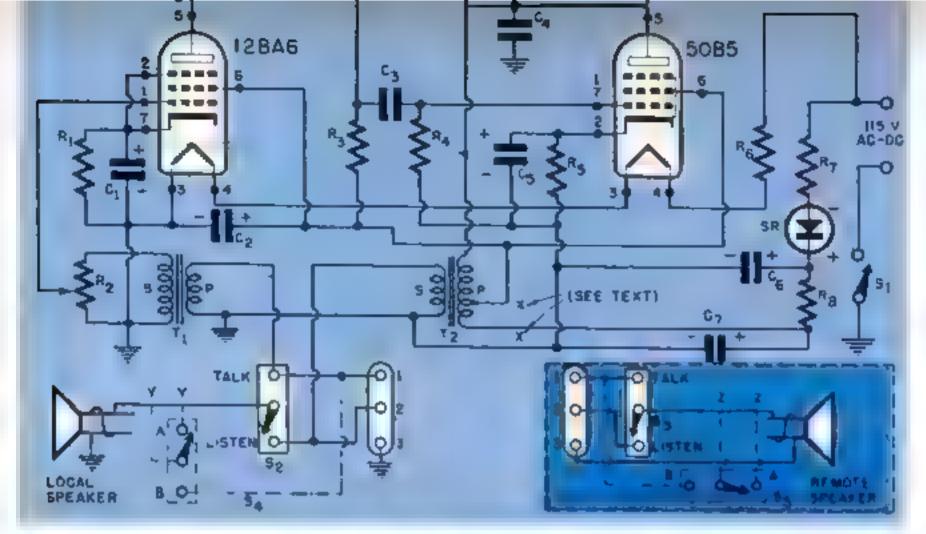
The other transformer, T2, matches the output of the 50B5 (about 2,000 to 2,500 ohms) to the speaker voice coils. Note the tap on the primary; this is a hum-reduction tap. Although it isn't essential, it will improve the performance of the circuit. If you use a transformer without this tap, connect the points marked X together.

Parts are mounted on a 1%" by 4%" by 5" metal chassis and on a clear plastic panel bolted to the chassis front. The controls that go on the panel are the on-off switch, \$1, the 250,000-ohm volume control, \$2, and the press-to-talk switch, \$2. A 3-contact strip is mounted on the rear chassis edge.

After mounting the parts—preferably in the approximate locations indicated in the photos—proceed with the wiring. First make connections to the secondary of T2 and the primary of T1, then wire \$1 and the terminal strip. Now follow the wiring diagram, reading from left to right. Leave the rectifier circuit to the last. When you get to it, be sure that both leads are connected to the rectifier before wiring C6 on top of it.

Three-conductor cable wires the master and remote units together. Connections from one terminal strip must be made to the corresponding numbers on the other.

Once you have an intercom installed, you'll find many extra uses for it. It's possible, for example, to pipe music from room to room by placing the master



LIST OF PARTS

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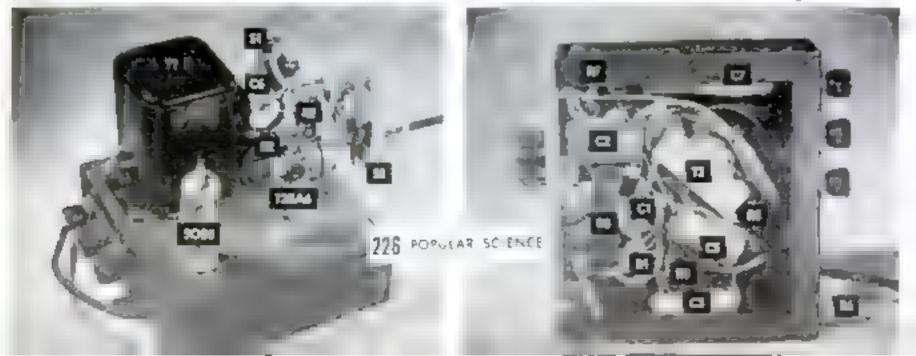
AC DL unit uses speaker and two table a uplafor in taster or an earlier Rank become right entions only speak r and switch

unit in front of the radio. Since \$2 is a spring action switch and normally in the listen" position, you either have to replace it with an ordinary SPDT switch, or, better still, add 54. Break the original connection at the points marked Y-Y and were in the new switch. When \$4 is in position a, intercom operation remains unchanged, when it's Hipped to b, the master unit is locked in 'talk" position

The same considerations apply to the remote unit. Adding \$5-and breaking the original lead at Z Z-readies the small box to act as a baby tender. Place it next to the baby's city and if the venugst i coes you can here it at the master unit

Clear plastic front panel is at high directly to amplifier. No pilot light is needed since plastic window shows when tubes are lit classis, it can be moved to the top

The output transformer was paced trader the chasses in this set. If you use a shallow







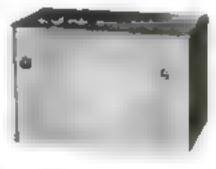


Unit Modernizes Old TV Sets.

If you have an early TV receiver that tunes to only 3 or 5 channels, this remote control unit will help bring it up to date. Designed for use with any type of receiver, the unit provides tuning on all channels. It turns the set on and off, tunes in stations, and controls contrast and brightness from positions up to 50' away. It's especially good for projection sets, best tuned from a distance

Made by Transvision, Inc., New Rochelle, N. Y., the unit sells in a walnut cabinet for about \$69—or \$4 less without the cabinet. A 25' cable is included.

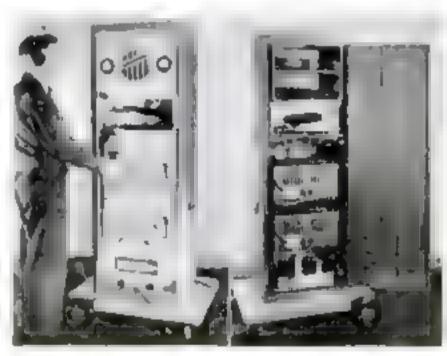
Single Antenna Serves 24 Sets. Here's a unit that makes it unnecessary for television or FM antennas to sprout all over the roof of an



apartment building. Called a Telecoupler[®], one unit enables up to eight receivers to use a single antenna, or as many as three units can be connected in cascade to one antenna lead, raising the receiver total to 24 without interaction between sets. Television Equipment Corp., New York, makes the unit.



Child Can Hear Own Records. A magnetic recorder for children introduced by CE uses an 8" paper disk coated with "powered" iron. Disks revolve at 20 r.p.m. and hold about two minutes of recording. Records can be erased with a small magnet. A 3%" loudspeaker doubles as the microphone. Nursery scenes decorate the case.



PA System Rolls on Dolly. Signal Corps technicians at Fifth Army headquarters in Chicago have combined a publicaddress system, phonograph, and AM radio into one compact unit for portable use. All elements are housed in a cabinet set securely on a dolly.

Front and rear views are seen above. Two amplifiers are included, one being an emergency spare. The record changer operates at either 33% or 78 r.p.m. A lead from one electrical outlet feeds all elements.



A simple fig. above left, is used to drill the cross holes in brass posts for the rail. Jig consists of two holes through scrap steel at right angles. Dowels attach brackets, right

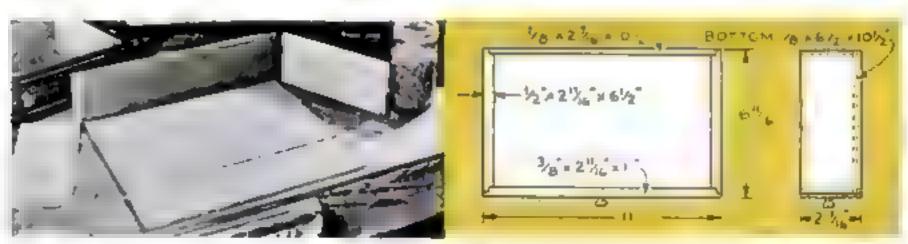
Brass-Railed Clock Shelf

A HANDSOME mantel clock deserves a handsome mantel. If you have the clock and not the mantel, this brass-railed shelf offers a happy substitute.

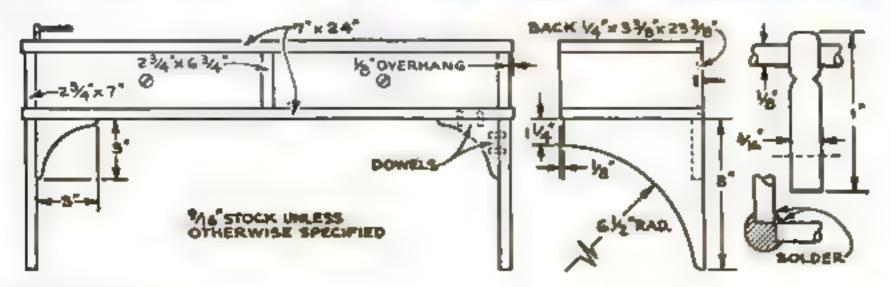
Select stock to harmonize with the clock case—mahogany, black walnut, or other cabinet wood. Black walnut was the choice for the shelf shown. Except for the %" drawer fronts, this is all 9/16" stock. Hidden surfaces can all be plywood.

In assembling the 7" by 24" top and bottom shelf pieces to the sides, allow a %" overhang at the ends. Stop-rabbet the rear edges of these four pieces to receive the back panel, Assemble with glue and large brads.

The rails are %" brass rod, posts 3/16" brass rod. The posts can be shaped by chucking in a drill press, rounding the ends, and forming the groove with a triangular file. Two posts with right-angle holes are needed for the corners. Solder the rails to these only, or braze them for a better color match. Tap the posts into undersize holes. —Walter E. Burton, Akron, Ohio.



Drawer details are shown above. Groove front for a decorative effect and install brass knob.



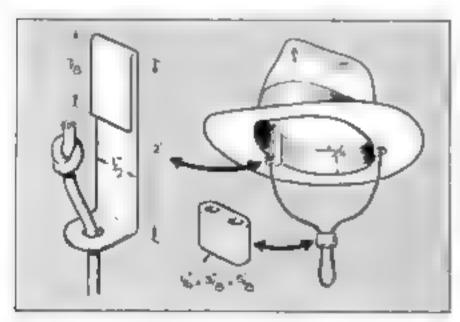


Insert Prevents Shocks

A BUTTON-SHAPED flexible insert, pressed permanently into a light socket, prevents shocks to probing fingers. The brass center ring makes contact only when a bulb is screwed in but breaks the circuit when the bulb is removed. Shock Stopper® is manufactured by Container Specialty Co., Cleveland, and is priced at three for 25 cents.

Seams Ripped on Machine

Inserted instead of the needle, this knifeedged attachment rips seams just about as
fast as they were sewn in by the machine.
The ripper penetrates material by spreading the weave without cutting the cloth.
Machine-sewn seams, more taut than the
material, resist the ripper's pressure and are
cut. Then the seam is pulled apart. The
device is made by the Gilman Engineering
and Manufacturing Co., Janesville, Wis.



Metal Clips Hold Hat Cord

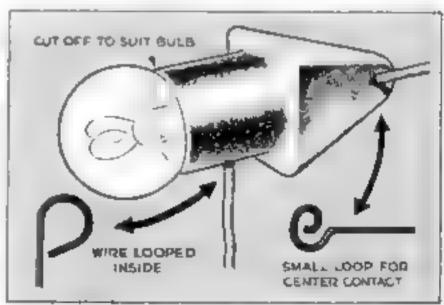
This simple hat cord, secured to the sweathand by two metal clips, keeps your hat in place in wind or weather. It can be transferred from one hat to another, since the clips are slipped over the band and held by pressure when the hat is worn. Bend up the chps from tin-can stock and use plastic cord.—N. Youteff, Bronx, N. Y.



Wallpaper Provides Patterns

For engraving tumblers with a hand grinder, you'll find a wide variety of designs in a wallpaper sample book. Cut out the pattern, leaving enough margin to encircle the inside of the glass and to rest on the bottom. Stuff cloth inside to hold the design in place while engraving. Use a cone-shaped point.—Ralph S. Wilkes, Keuka Park, N. Y.





Erasers Make Model Sockets

FLASHLIGHT sockets for models can be made from ordinary slip-on pencil erasers. Cut off enough of the rubber so only the metal part of the bulb is covered. Punch a hole in the side and another in the end. Push contact wires through the side and end, looping them as shown in the drawing above.—Howard Fischer, Monaca, Penn.



Rig Tips Boats for Cleaning

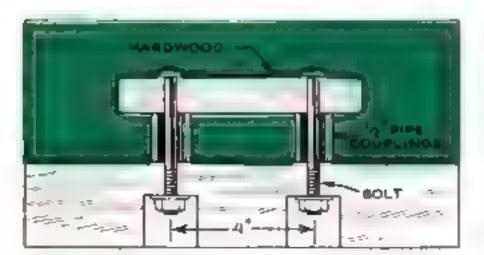
SKIDDING a rowboat ashore to tip, drain, and clean it can be quite a chore, especially if one man has to do the job. A simple rig that will do everything but clean the boat for you can be built of scrap lumber and a couple of saplings. The one pictured in use at a fishing camp near Remer, Minn., is being handled by two men. Lashing down the top of the mast when the boat is tipped would make it a one-man job. The setup can be assembled in less than an hour.

The mast is a pine sapling about 12' long. Wired to the mast about halfway up are the

ends of two 6' saplings. The other ends of these are spread to form a triangle and the bases of all three are nailed to a two-by-four. At right angles to the triangle, two two-by-fours were nailed to the bottom board. Iron braces join these and the two shorter saplings. A few scrap boards are nailed across the triangle to brace it.

A short piece of wood is secured with a single bolt to the cross brace just above the boat's gunwale. When the ng is placed against a boat, this pivoting piece is turned parallel to the mast, clamping the gunwale to the rig.

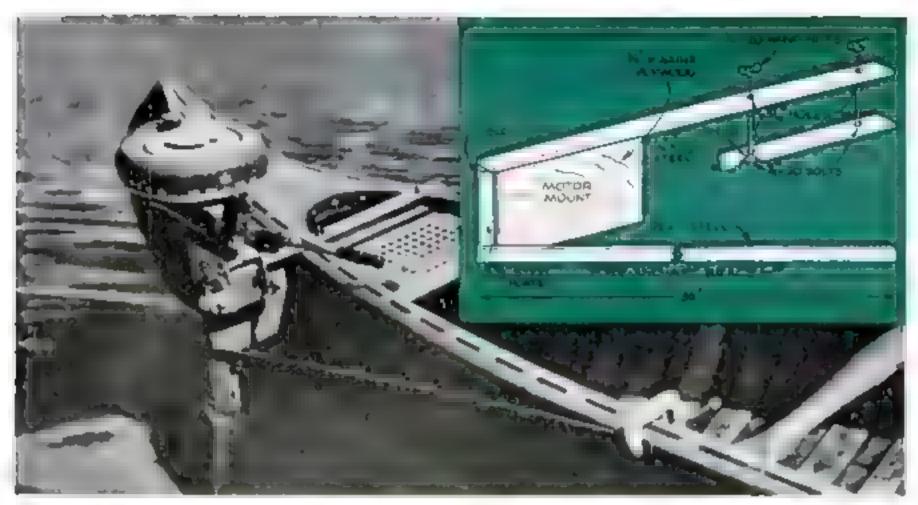
In use, a boat is floated or skidded onto the rig and clamped. Then a rope tied to the top of the mast is pulled to tip the boat. —Henry E. Bradshaw, Des Moines, Ia.



Pipe Couplings Space Cleat

Quickly installed mooring cleats for a small dock can be made of hardwood, bolts, and brass pipe couplings. Drill the hardwood and the dock at the same time. Then you'll be sure the holes align. If the dock member is too thick for the bolts you have, counterbore from underneath as at left. —Carl V. Hanson, Renton, Wash.

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Bracket Mounts Outboard Motor to Power Canoe

No hours need be drilled nor any other changes made in a canoe to mount this motor bracket. It's sturdy enough to handle a lä-hp. motor easily, and it can quickly be attached or removed without tools. Two wing nuts and a C clamp hold it securely.

The motor mount is a %" by 5%" by 7" piece of steel that's welded to the main support. As padding between the steel plate and the motor clamps, I used %" plywood the same size as the plate. Four %" flathead wood serews, countersunk, hold the plywood and steel together. You'll have to chamfer the top inside edge of the plywood to clear the weld bead.

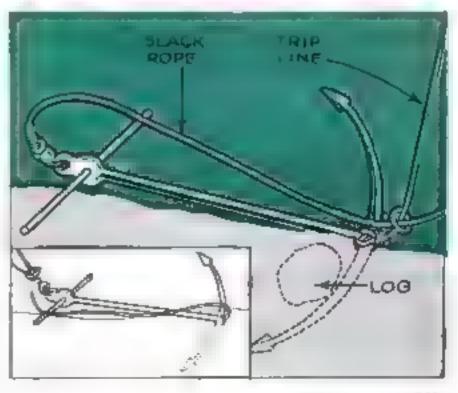
One end of the 36" fore-and-aft brace is welded to the lower outside corner of the motor mount at such an angle that it meets the outside of the cance gunwale. This

angle will vary with different canoes. The brace serves two purposes: to absorb some of the forward thrust and upward twist exerted on the mount by the motor, and to protect the protruding motor from hooking on a dock or piling. The forward end of the brace is held to the gunwale by a C clamp.

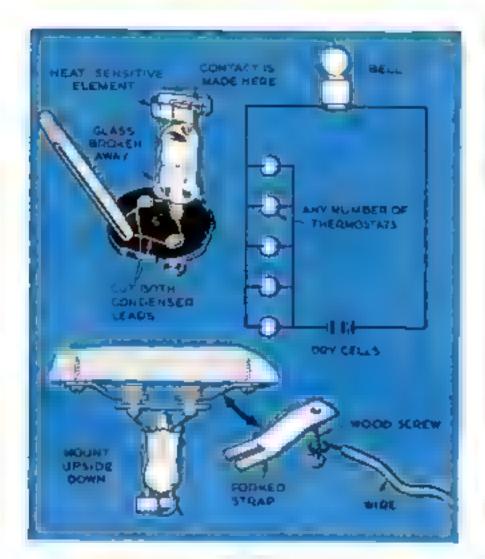
The lengths of the main support and the shorter one that fits beneath the inwales will depend on your canoe. Two wing nuts pull the shorter support up under the inwales. The heads of the two K"-20 brass bolts are brazed to the underside of the smaller support. Red-lead the bracket and then paint it to match the canoe. In laying out the bracket, take care that the motor is out far enough to clear the side of the canoe through the full steering range.—William A. Poellmitz, Schenectady, N. Y.

Line Clears Fouled Anchor

When the anchor of a small craft is caught under a rock or log, you usually can pull it free if you've rigged it in this way. Where the shank of the anchor meets the arms, make fast a 3/16" line that's the same length as the anchor line. Slip the free ends of both through a 2" ring. Slack off on the smaller line when at anchor. The ring will rest at the anchor's stock. Pulling on the small line will ordinarily free the fluke. If the anchor is badly fouled, run the boat straight ahead, keeping the smaller line taut until the anchor is clear. Then haul in both lines.—N. C. Darling, Danbury, Conn.



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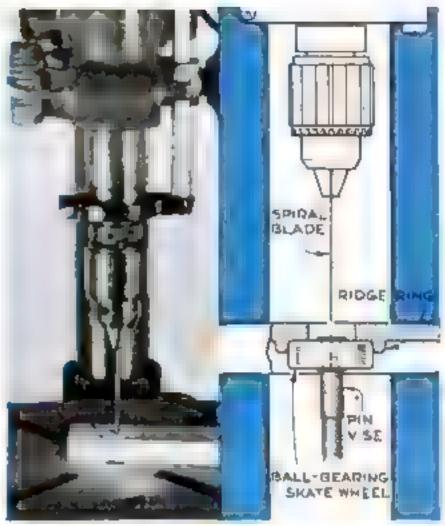


Tube Starter Is Fire Alarm

FLUORESCENT-TUBE starters that have glass-enclosed heat-sensitive switches may be converted to small but reliable thermostats. One excellent application for them is in a homemade fire-alarm system that will protect your home, shop, or garage.

Pry back the tabs that hold the aluminum cover on the starter and remove it. Taking care not to damage the bimetallic element inside, break away the glass envelope to expose the U-shaped strip and contact wires. Cut off and discard the condenser.

If you wish to make a fire-alarm system, mount the thermostats inverted, holding them with two forked, screw-held metal strips. Stairways, corridors, and the vicinity of stoves and heaters are likely locations. Wire them in parallel with each other and in series with dry cells and a loud bell. Test regularly by holding a match 1" underneath. —Harold Kruer, Covington, Ky.



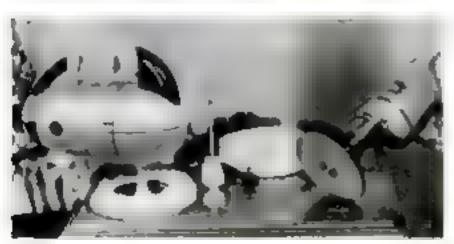
Drill Press Used as a Jigsaw

In a pinch you can rig up your drill press to handle small jigsawing jobs. The stunt is made possible with a coarse spiral blade held tight as it spins.

Though designed for reciprocating motion, these blades will actually spin through wood as thick as X". The dodge is chiefly useful, however, for occasional jobs on thin stock. The blade naturally wears only at the working area; when it breaks, just lower the chuck and remount it.

Clip the ends of the blade straight, chuck one end securely, and lower the blade through the center hole of the table. Lead the blade through the axle hole of a ball-bearing skate wheel that fits the cast ring usually found under the center hole of the table. Clamp the lower end of the blade tightly in a small, conical-nose pin vise. Lift the drill chuck until the blade is very taut and lock it.—S. S. Palestrant, Bronx, N. Y.

Mixer Motor Gets New Jobs

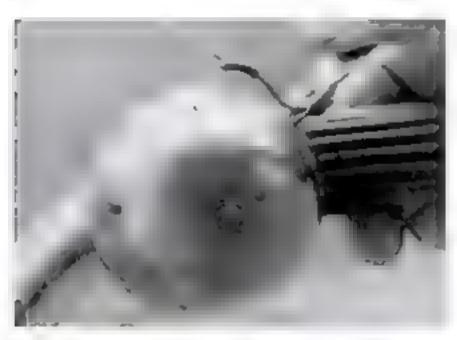


You can convert your kitchen mixer to a wider range of jobs around the house with the Toolzon*, a simple adapter that fits most mixers. Attachments include a drill chuck, buffer, and a flexible-backed sanding disk coated with aluminum oxide. The bonnet of the buffer is ** wool pile. Made by the Towle Manufacturing Company, of Walnut Creek, Calif., the attachments are priced at about \$3.25 each. The attachments also can be fitted into the chuck of electric hand drills.



Tape Binds Edges of Papers

EDGES of blueprints, maps, sheet music, and other frequently handled papers can be kept from fraying by binding with tape. A tape dispenser produced by Minnesota Mining & Mfg. Co., St. Paul, Minn., is designed especially for this job. It can also be used to reinforce the fold in sheet music and other papers. An automatic adjustment accepts thicknesses of paper up to 1/16". The edger takes either %" or %" tape.



Muffler Quiets Bicycle Bell

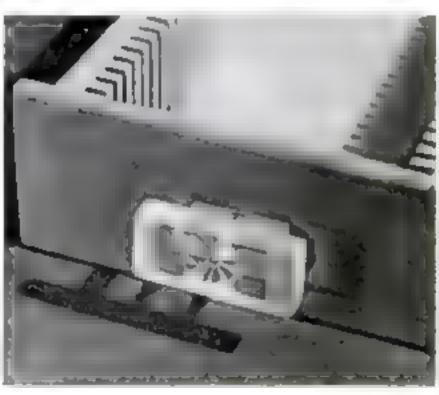
ROUGH paving often causes a bicycle bell to jingle. Here's a muffler that will stop this. It consists of rubber tubing fitted on an aluminum extension bolted to the regular operating lever. The extension is shaped so the rubber rests against the bell while the latter is not in use. If the clapper bounces, the rubber muffles the sound. The extension doesn't hinder normal operation of the bell.—John M. Avery, Dexter, N. Y.

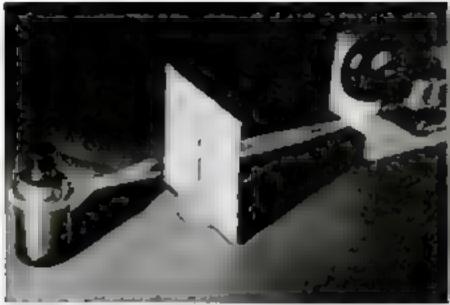


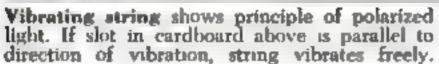
Shop Tools Emboss Plastic

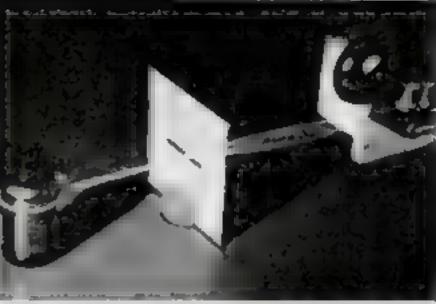
ANY plastic that softens when heated can be decorated by embossing with countersinks, end mills, and other common workshop tools. Above, a %" end mill is being used to emboss a piece of %" Plexiglas[®]. This became the drawer pull shown below.

For such work, chuck the tool in a drill press, heat the plastic until soft, rest it on a piece of glass or polished metal on the drill press table, and bring the tool down against the plastic by operating the spindle feed. Unusual designs can be made by pressing knurled surfaces, fancy metal buttons, printer's ornaments or type, and other objects down against the softened plastic.









But turn the cardboard 90° as at right, and string vibrates only as far as the slot. A polarizing filter stops random light in same manner

Experimenting with Polarized Light

WHY will a pair of polarized sunglasses protect your eyes from giare at the beach? What happens when you use a polarizing filter on a camera? How does a polarized visor improve your driving vision?

All these useful devices rely on polarized light. Here are some experiments designed to show the characteristics of such light. The necessary equipment is simple—just two pairs of polarized sunglasses. Or you may prefer to do what I did—cut in half a pair

of inexpensive army goggles. See the headlamp experiment below,

To understand polarized light, you must remember that light vibrates in all possible directions in the plane perpendicular to the line in which the light is travelling. But suppose some of these vibrations are cut off, leaving light that vibrates in only one direction? You have polarized light.

Light can be polarized in several ways. One is by means of a polarizing screen or



Polarized headlights would work like this. Put your screen over a flashlight as at left with its crystals arranged diagonally, to represent an



approaching headlamp. Then hold up another screen at the opposing angle. This, like a polarized windshield on a second car, cuts glare

filter. This is a grille consisting of myriads of microscopic crystals, aligned in a single

direction in transparent plastic.

When ordinary light strikes such a screen, only that part vibrating in a line parallel to the aligned crystals passes through. The rest is stopped. On the other side, the polarized light will also be stopped if it strikes a second screen turned with its crystals at right angles to those in the first.

A simple mechanical analogy at the top of the facing page shows why. Here one end of the string is tied to the clapper of an electric bell, the other to a fixed support.

Vibrated up and down by the bell clapper, the string can be likened to light that has been polarized by passing through a single filter. If another filter, in this case the slot in the cardboard, is arranged in the direction of the vibration, the wave goes through. But turn the screen at right angles and the vibration is stopped

It has been proposed that automobile headlights make use of this principle to control glare. Polarizing screens would be placed over the lamps with their crystals aligned diagonally. Another screen would go on the windshield with its crystals aligned

in the same direction.

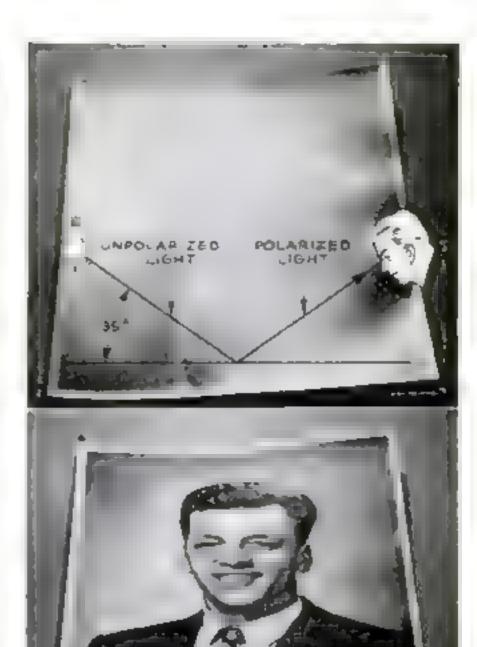
When two cars so equipped face each other on the highway, the polarizing screens—the one on your windshield and those on the lamps of the other car—would cross at right angles. The other man's headlights wouldn't bother you, although you could still see the highway perfectly well.

A flashlight and two polarizing screens will enable you to demonstrate this. In the photos on the facing page, a piece of tape was stuck across the face of each screen to

show the direction of the crystals.

Nature sometimes takes a hand and polarizes light through simple reflection, as seen in the adjoining column. Beach sand, glass, paper, wood, and highways may cause such polarization. This underlies the usefulness of polarizing sunglasses and car visors.

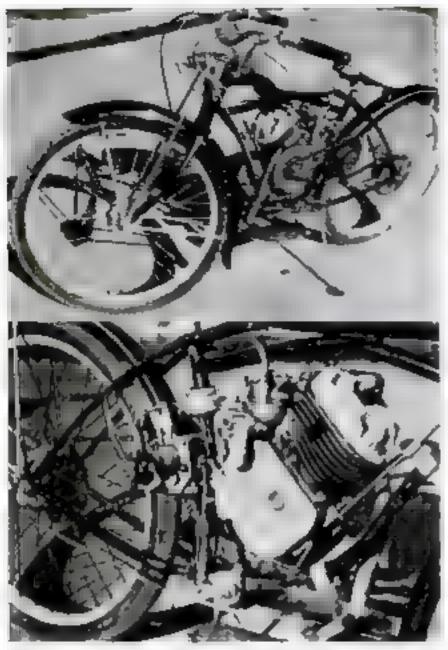
Polarization also occurs if a light beam is scattered by smoke, dust, and the like. You can show this by filling a glass with water and adding a little milk. In a dark room, shine a flashlight down through the glass. Viewed at right angles, the beam is visible. Actually some light has been polarized at right angles to the beam. You can prove this by putting on a pair of polarized glasses. The beam of light almost disappears.—Kenneth M. Swezey, Brooklyn, N. Y.



Light reflected from nonmetallic surfaces is often polarized. This occurs to the greatest extent if the light hits and rebounds at about 35°. View a smooth-surfaced (not glossy) photo from this angle and you'll get a lot of glare, as in the top photo. But put on your polarizing sunglasses and take a look from the same angle. You'll then see the photo clearly.



Flashlight beam shining through water colored with milk is partly polarized in a direction at right angles to the beam (left). Don your glasses and beam almost disappears (right).

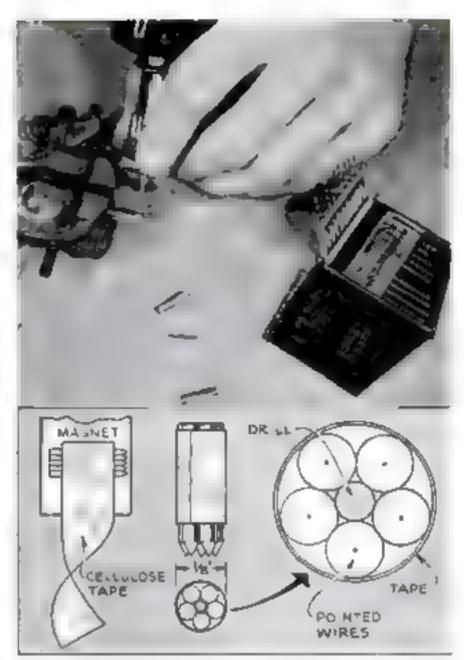


Motorbike Has Two Speeds

ADDING a two-speed model of the Britishmade Albion transmission to a standard Whizzer bike motor increased the top speed and added power on the getaway, according to Bob Pfetzing, of Moline, Ill., who built the hybrid machine. Clutch and throttle controls are hand operated, as on a standard Whizzer. Gears are shifted by foot. The pedal is just above the left footrest.

Pfetzing installed the transmission, which is fitted with a dry-disk clutch, directly behind the engine. Crankshaft and transmission are connected by a chain. Another chain drive runs from the transmission to a sprocket on the axle of the bike's rear wheel. —Tom Griberg, Moline, Ill.



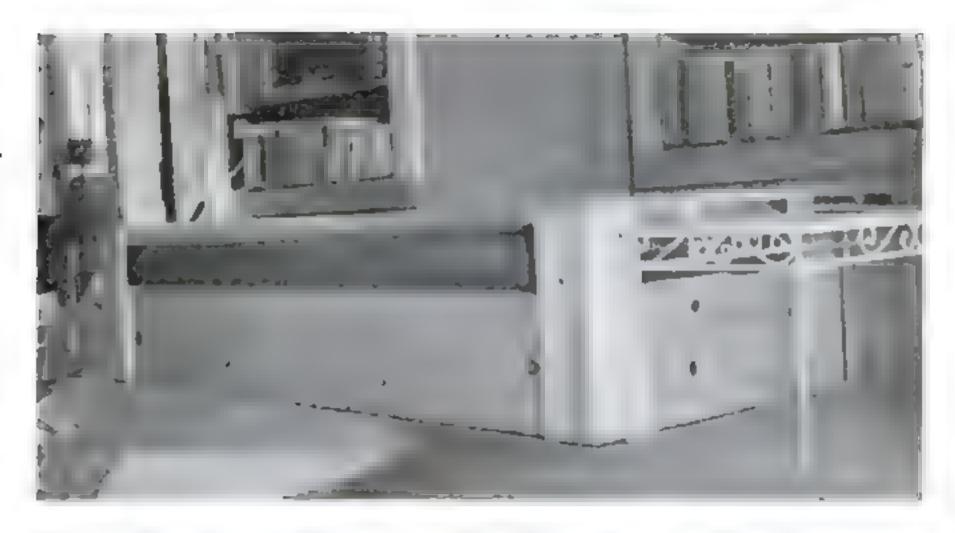


Wire Collets Hold Tiny Brills

SMALL collets that'll equip a hand grinder to hold drills from Nos, 60 to 80 may be made from paper clips and cellulose tape. From small clips, cut \$" lengths. Point the ends on a grinding wheel to deburr them. Lay the pointed wires on a magnet, as shown in the sketch, and press a strip of tape over them. Pull them off the magnet with the tape and bend the tape around them to form the collet, Insert a No. 60 drill in the collet and wrap enough turns of tape around the collet to make it fit snugly in the X" collet of the hand grinder. Five-wire, four-wire, and three-wire collets will hold drills up to No. The three-wire collet may be soldered instead.-Don Pittwood, Moscow, Id.

Magnets Hold Memos

This 14" by 18" magnetic bulletin board for the home comes with six small magnets that anchor memos and shopping lists to the board. A magnetic pencil holder also is included. Magnetic Merchandising, Inc., New York City, prices the board at about \$2. Slots in the top corners of the board's back cover let you hang it on small screws driven into a wall. The board is available in three colors: red, yellow, and blue.

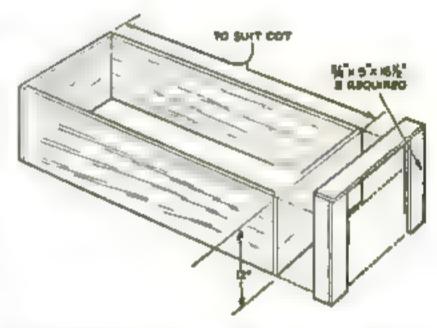


Cot Boxed In to Make Day Bed

A rew pine boards and hand tools transformed an inexpensive iron cot into the day bed pictured above—a welcome addition to a playroom, porch, or summer cottage. The boards make a framework that fits over and conceals the cot.

The first step is to cut down the cot, if it needs it. I hacksawed the legs of mine so that the height from the top of the springs to the floor measures 11%". Saw the 1" by 12" sideboards to suit the length of the cot. When laying out the 1" by 12" endpieces, add twice the stock thickness to their length. This addition lets the endpieces lap the sides. Nail or screw the sides and ends together.

Next cut out the eight uprights. You might have to alter the 18%" length shown in the drawing to suit the thickness of the mattress you'll use. The uprights should be high enough so the arms will clear the mattress by about %". If the cot has raised



ends, either cut them off or proportion the end uprights to clear them. Two uprights are screwed in place at right angles to each other on each corner. Drive 1%" screws from inside the frame. Nail or screw on the arms. If a tail person ever has to sleep on the cot, just lift off the complete frame. —Thomas F. Donovan, Concord, N. H.

Springs Provide Muscle for Turning Mattress

Housewives who find it laborious to turn over a mattress will like this new device. A metal bar, ordinarily clamped along side of the bed, can be raised as shown at the right to a point where the mattress can be pivoted. Most of the lifting work is done by strong springs at the head and foot. American Mattress Turner Co., New York City, makes it to fit standard bed sizes.





Bastes Meat Automatically

Working on the percolator principle, the Percomatic Baster® intermittently squirts fluid from the bottom of a roaster over meat being cooked. The four-piece unit, made by the Paul V, Shell Co., Kansas City, is placed on the bottom of the pan with the foot strap under the roast or fowl. Then liquid is poured into the pan to cover the base. Heat does the rest. The top tube is adjustable for height. Retail price is about 70 cents.



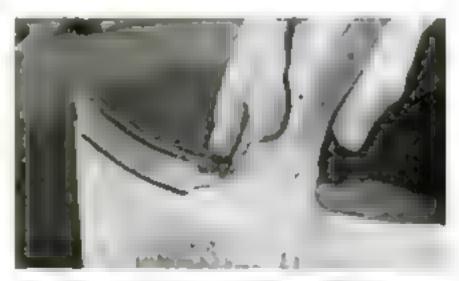
Hook Lifts Small Boat

For easy handling of the bow of my runabout, I made a small bale hook that fits in the towing eye on the stem. It's a short length of 5/16" brass rod, bent as shown, and threaded on the straight end. A nut holds the rod to the handle. Such a hook is especially useful when the boat is fitted with detachable launching wheels (PS, July '49, p. 211).—Clinton R. Hull, Costa Mesa, Calif.



Joists Provide Storage Space

Shelves built between the ceiling joists in my basement workshop provide additional storage space for small items. I use cheese boxes to hold the articles. The boxes are numbered and indexed, making it easy to find the desired object. This method of storage in otherwise wasted space provides a drier place than nearer the basement floor, and also keeps the articles from children—William R. Kern, Philadelphia.



Footrest Eases Shoveling

Pushing a shovel into the earth can become tiresome because of the sharpness of the edge on which your foot presses. A comfortable foothold may be made by riveting to the shovel edge a strip of T- or L-shaped metal as shown in the photo. I cut a piece from an old sled runner and bent it to match the contour of the shovel. Then it was clamped to the shovel while holes were drilled and the 3/16" rivets installed. The bar is attached to the front of the shovel.—Walter E. Burton, Akron, O.



Photos are taken on the auxiliary scope, foreground, at five-minute intervals. Pictures tell time of rain and rate at which storm travels.



Plane used for seeding clouds carries tank of compressed carbon dioxide. The gas as well as solid dry ice has been used to induce rain.

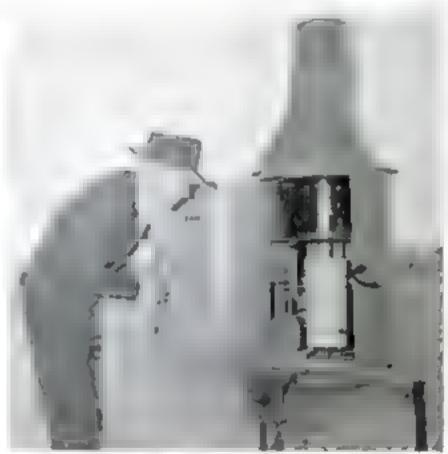
Radar Reads Rain Signs

WAR-SURPLUS radar equipment is playing a big part in the mechanization of farms in the El Paso, Illinois, area. Installed as part of an experiment in inducing rain artificially, the radar scope has shown that the course and speed of approach of rain clouds can be plotted very accurately.

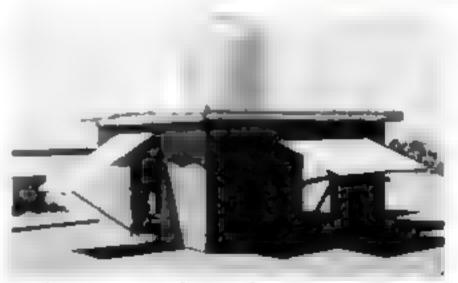
The experiment, being jointly conducted by the State Water Survey, Urbana, Ill., and the Pfister Hybrid Corn Company, of El Paso, uses the radar equipment to spot rain clouds up to 75 miles away. A plane carrying dry ice or carbon dioxide has plenty of time to get above the cloud and "seed" it at the place where rain is wanted

The Pfister farm, one of the country's largest producers of hybrid corn seed, has thousands of acres in cultivation. As many as 1,500 workers are employed to harvest the crop, and the rain spotter has proved its value by giving advance warning of the approach of work-stopping rain

Present plans call for using the radar set to get measurements of the amount of rainfall as well as the exact location of storms. This will be done by making photographic recordings on an auxiliary scope and checking the pictures against the information given by scores of water gauges located in the area of the experiment. Later, the gauges may be made unnecessary.



Pfister checks the reading of an automatic water gauge. Over 40 gauges are in use in the 376 sq. mi. area covered in the experiment.



Radar dome, enclosing the antenna, sits atop the roof of the radar room. The war-surplus equipment can "see" clouds up to 75 miles away.



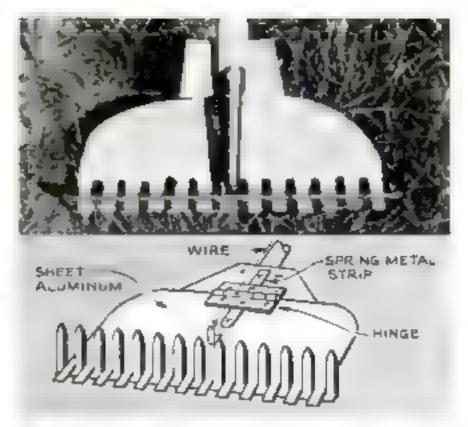
Electric Fence Is Portable

SITTING on top of the ground on crosspiece feet, these fence posts can quickly be set up or moved to a new location. Wire can be attached or removed without tools. The post is placed so that the slot in the insulator parallels the wire. Then the post is turned 90°, locking the wire in the plastic insulator. Made of heavy steel angle stock, the posts are enameled yellow. The maker is Portable Electric Fence Post Co., Graetinger, Ia.



Grain Elevator Loads Hay

On THIS Iowa farm, a belt conveyor—ordinarily used to move grain—is also put to work transferring bales of hay from truck to barn. The bales are merely turned at an angle and dropped on the moving belt.



Rake Unloads Its Leaves

Pulling a wire at the top of this rake's handle scrapes leaves and trash off the teeth. To make it, notch one edge of a sheet of aluminum to suit your rake. Mount it as shown, using a piece of spring steel and a butt hinge. The wire is attached to an angle iron riveted to the aluminum.—William Wiesler, St. Louis, Mo.

Rod Supports Garden Tray

in diameter—a heavy aluminum pie pan will do—and a k" iron rod at least 2' long made this tray, Drill a hole in the center of the disk. Thread one end of the rod and sharpen the other for sticking in the ground. Washers and nuts threaded on the rod hold the tray.—Will Stoll, Elmhurst, Ill





Farm Gate Is Ornamental

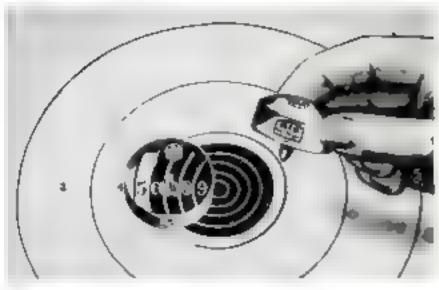
Besides improving the appearance of a farm, a barnyard gate of this type is "stock tight." The closely spaced pickets keep in pigs or chickens should they escape from their pens.—A. M. Wettach, Mt. Pleasant, Ia.



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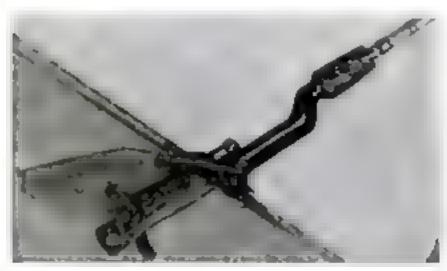
Target Scorer Ends Disputes

THERE'D be fewer arguments over rifle scores with this Eze-Scorer[®], a simulated bullet in a plastic magnifier. Inserted in a bullet hole, it enlarges your view of target area so that the close scores become more readable. It comes in .22, .38, and .45 calibers.



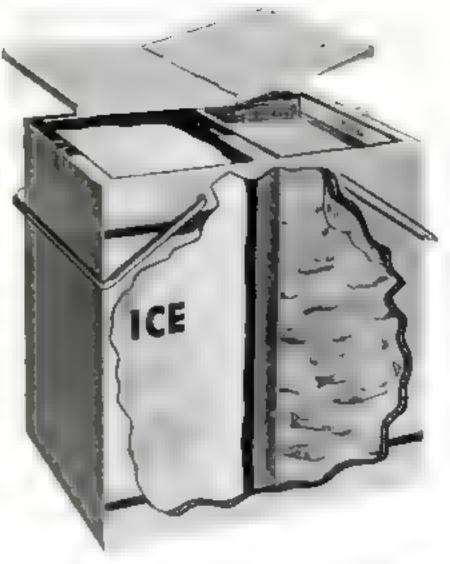
Golf Ball Goes Nowhere

You can improve your golf swing without teeing up or chasing balls with this practice device. Made by Taylor Products, of Detroit, it consists of a ball on the end of a spring-steel arm that spins around on a ball-bearing spindle when the ball is hit.



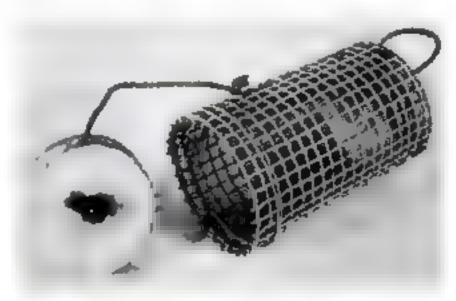
Pole Holder Fits Boat Seat

This new fishing-pole holder keeps the pole within quick reach of the fisherman as he rows the boat. Unlike most holders, which clamp on the stern, this fits under the seat, holding the upper part of the pole's handle in a rubber ring while the lower part clamps into a spring clip. It is manufactured by W. J. Peterson, of Akron, N. Y.



Ice Box Keeps Minnows Alive

FISHERMEN, long faced with the problem of keeping minnows alive for bait, can keep them happy and healthy for weeks in this new Ful-O-Life® refrigerated minnow box. One side is a tank for the minnows, while the other holds a cake of ice. The ice keeps the water cooled to a point where it retains the oxygen required by the minnows to live.



New Bait Lures Lobsters

Filled with only two ounces of Lob-Lure⁰, a new artificial lobster bait, this small, 6-inch-long basket is all that's needed to replace the five pounds of dead and decaying fish normally required to lure a lobster. Under water, the bait, which comes in putty form, slowly dissolves, attracting the lobster to the trap. The noncorrosive, easily cleaned, plastic-and-metal-mesh container is made by the Chicopee Manufacturing Corp. Kodachrome slides

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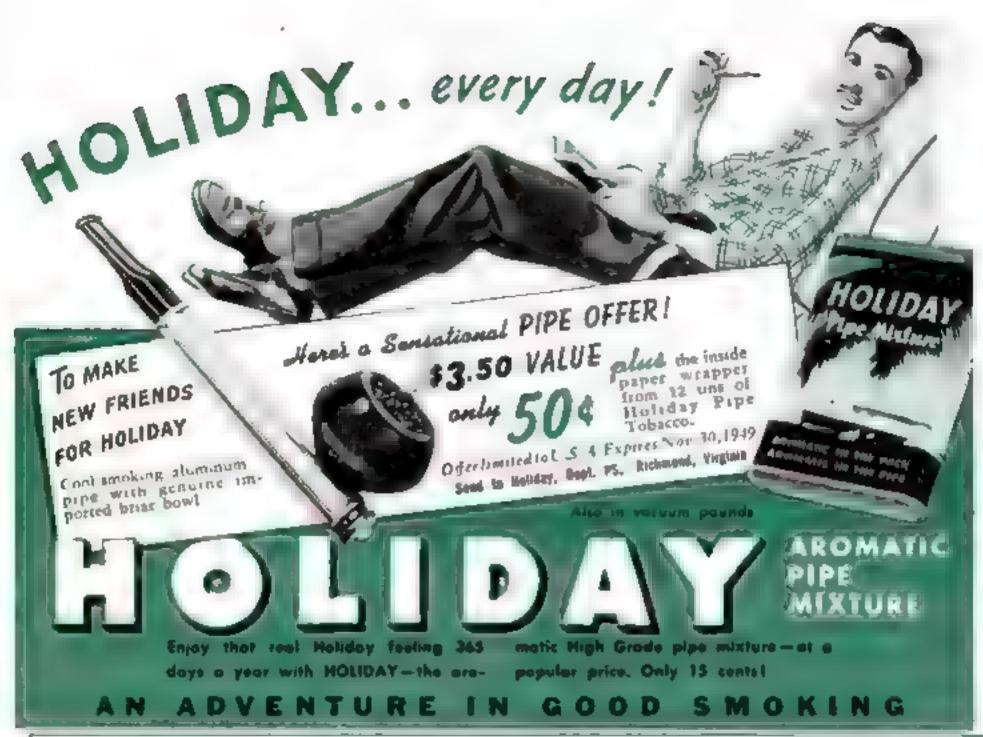
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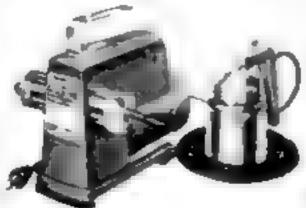
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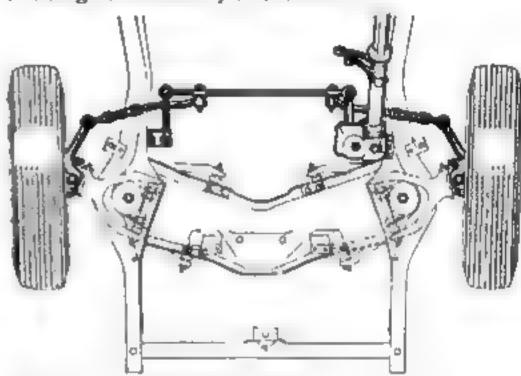
A Straight Steer About the NEW FORD "FEEL"



gense in a minute that here's a new "feel" in driving. That's because, for one thing, the '49 Ford has practically effortless "Finger-Tip" Steering—a new, symmetrical steering linkage combined with new independent front wheel suspension and extra-large worm and roller type steering gear. Either wheel is free to move up and down without affecting steering. Pitman and idler arms are of equal length and parallel. Tie-rods and lower control arms move through similar arcs to preserve steering accuracy at all times.

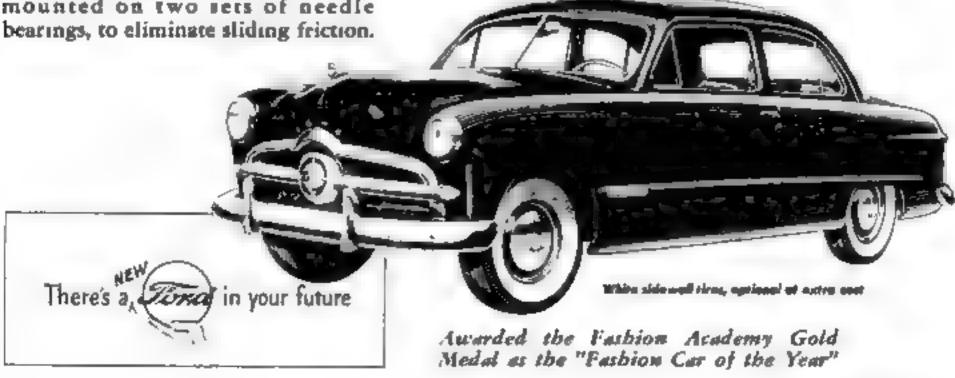
And the precision-bush steering gear uses a large triple-tooth roller, mounted on two sets of needle bearings, to eliminate sliding friction. Steering ratio is increased nearly 10°f for even easier steering control.

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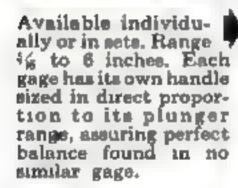
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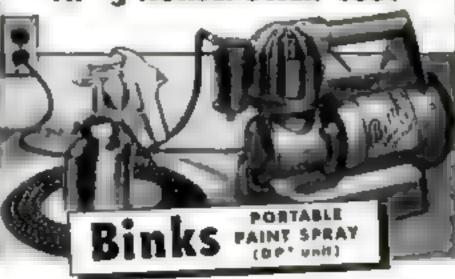
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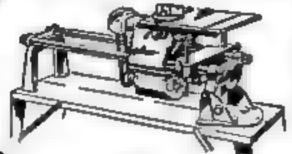
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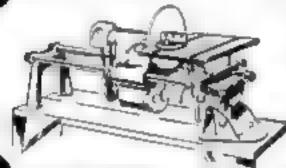
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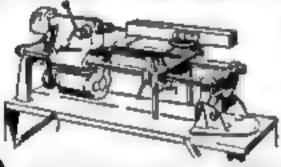
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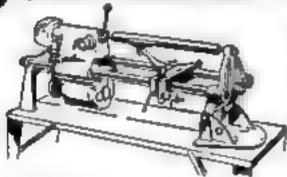
Extremely useful operation possible only with SHOPSMITH. 4" quill feed, automatic stops. Permits large, heavy pieces to be drilled or mortised quickly and accurately. Eliminates need for jigs. Length of work limited only by size of room.

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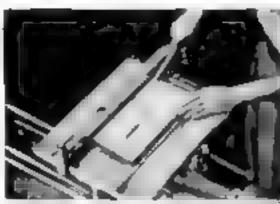


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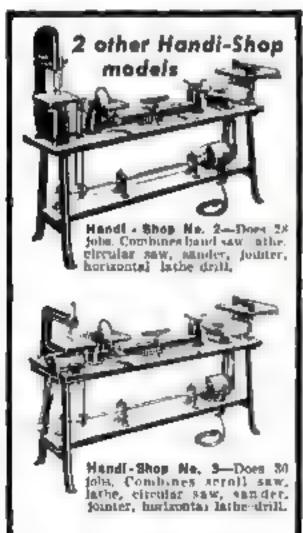
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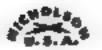
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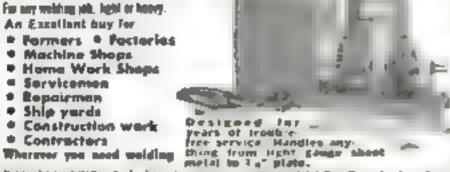


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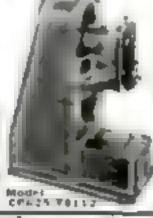
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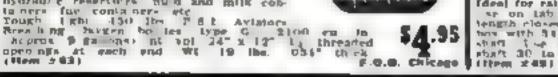
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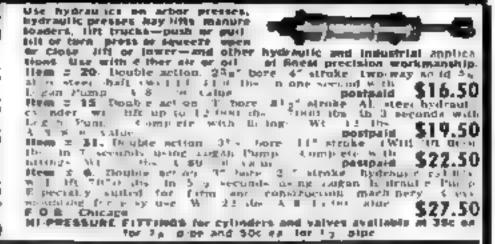
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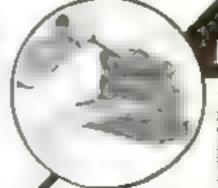
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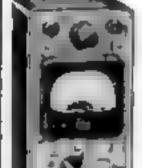
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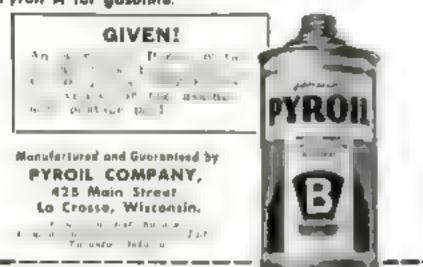
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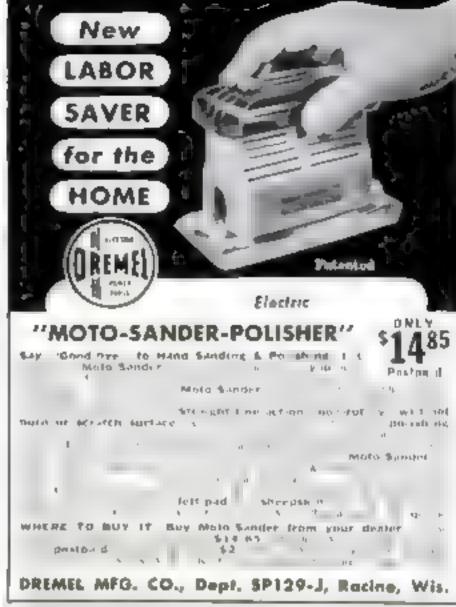
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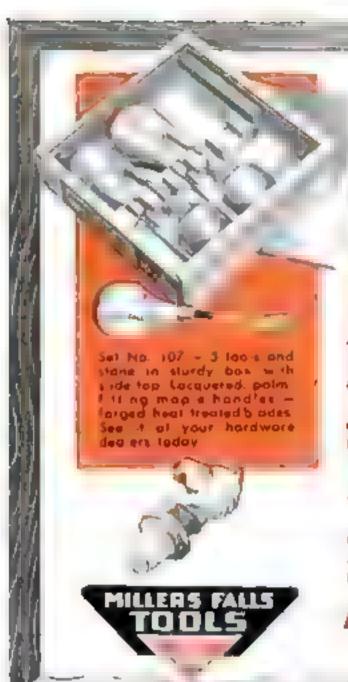
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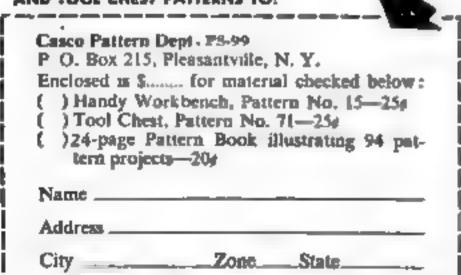
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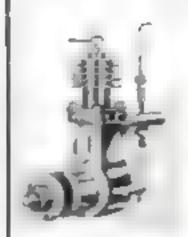
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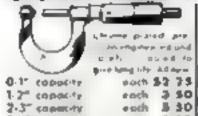
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11/2" 4 thread Lathe Chuck Adoptor, \$3 unice

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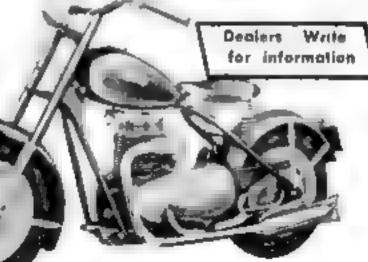




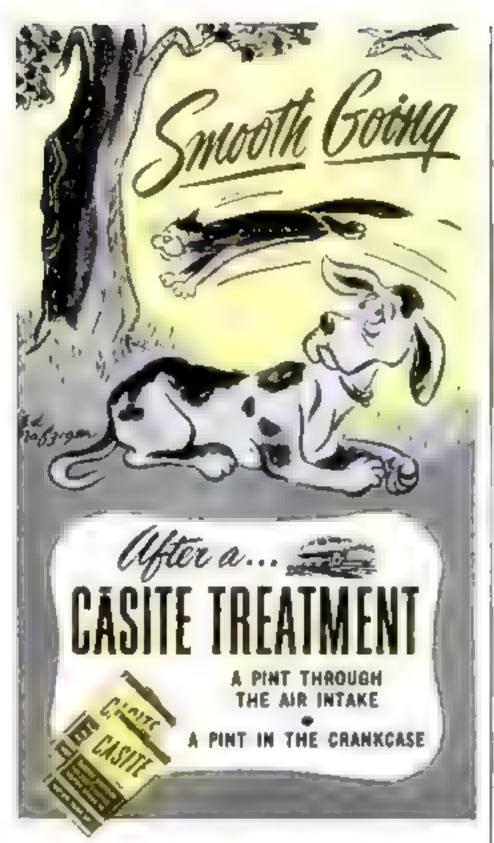
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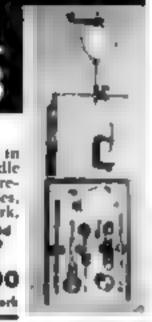
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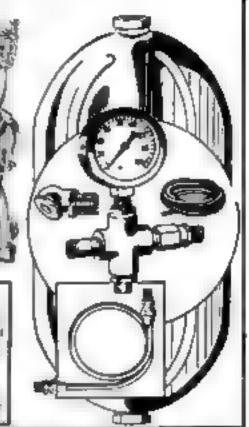
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Piston Tipe 1 cylinder 2 such hore (1) biroke Bai Bearing 1 77 f F M ad done if W Lapacity up to 6 54 C F M Mandested disconling pressure 75 F K F 7 MF 2 Sides W wide 117 m high 63% deep W, 28 ba

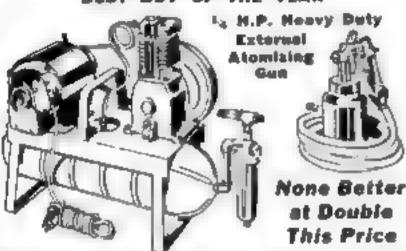
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140 CFM "WELLWORTH" BLOWER



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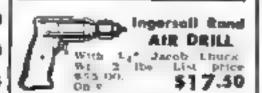
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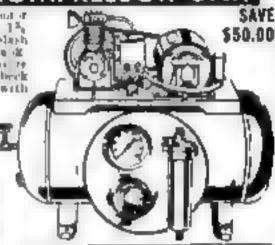


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Special \$79.50

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"Wellworth" 1/4" REDUCING VALVE AND GAUGE

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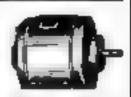
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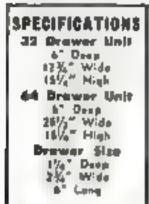
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No Soggy Somp. One of life's petty annoyances, that jelly-like mush on the bottom of a bar of soap, is eliminated by this holder. Made of Bakelite® to fit all soap dishes, the holder raises the bar of soap, permitting the water to flow away. The maker, H. P. Matson Co., of Akron, O., prices it at 10 cents.



Automatie Flapjack Flipper. The slotted, stainless-steel spatula is pivoted on its polished wooden handle by a thumboperated mechanism. Just pick up the pancake or hamburger, press the lever quickly, and the mechanism flips it over. The manufacturer is the Paul Grancell Company, of Los Angeles. It's priced at \$1.25.

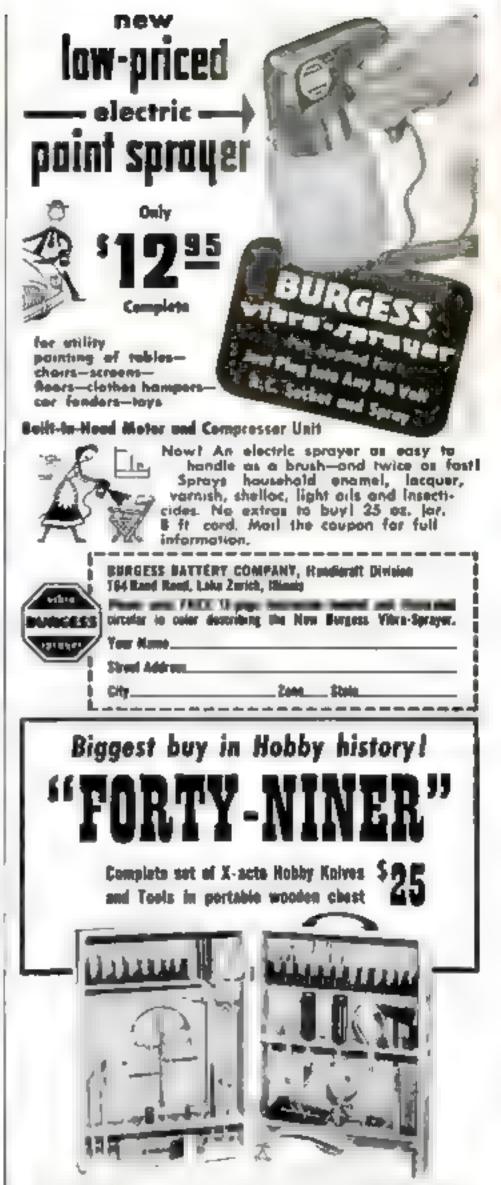
Modern Living



Rubber Grips Hold Towels. The Fing-O-Tip[®] has four live-rubber grippers that prevent snagging and make towel hanging a one-hand operation. The towel is pressed into a holder. Two screws hold the rack to a wall. The holder comes in red, yellow, green, or blue and is priced at \$1 by the A, J, Ganz Co., of Hollywood, Calif.



Watering Pot Has Pump. A clever way of watering hard-to-reach plants is found in the Aqua Floo. Pressing the brass knob pumps out a stream of water. Release the knob and it's ready to repeat. The watering pot is made of copper with a brass spout. It retails for about \$9. Dazey Mfg. Co., Los Angeles, is the maker



Every knife, tool and blade in the famous X-acto line. Precision made, easy to handle, joy of amateur and expert hobbycrafters. Other "big buys" in X-acto chests No. 82 Knife Chest, \$3.50; No. 86 Hobby Chest, \$10.; No. 87 Tool Chest, \$15.(Prices slightly higher in Canada.)



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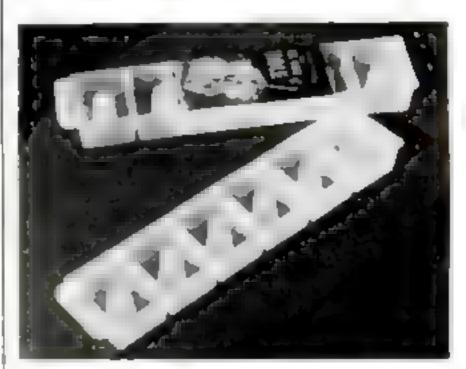
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Aids to Hodern Living



Brush and Pan for Crumbs. The Silent Maid Crumber[®], manufactured by Mastercraft Plastics Company, of Jamaica, N. Y., is a miniature dustpan and whisk broom molded of cellulose acetate. The maroon pan contrasts with the ivory-colored brush. A slot in the top of the dustpan takes the broom for convenient storage.



Ice Cubes with Holes. According to the maker of Lustro-Ware® ice-cube trays, Columbus Plastic Products, Inc., Columbus, O., ice cubes with holes are more than a novelty. They freeze quicker, cool drinks faster, and are easier to crush. One cube at a time, if desired, may be removed from the flexible plastic trays. The trays may also be used for dessert molds.

TOUR OWN

CONCRETE

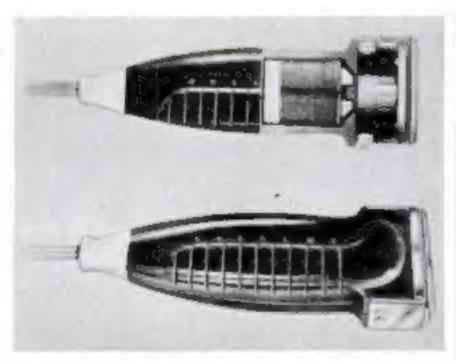
BLOCK

HOME

CYF9-OX4-RHA4



Electric Deep-Fat Fryer. There is only one control to set on the Fryryte®, and the heat of the fat is automatically controlled by a thermostat. The fryer holds three pounds of vegetable fat. Temperatures range from 350° to 400°, cooking food in from two to eight minutes. The maker is Dulane Mfg. Co., Joliet, Ill. About \$25.



Wet Electric Shaver. The Vibrazor®, operating on 115 volts AC, uses a standard double-edged razor blade. It may be rinsed under the tap as you shave, for the electromagnetic drive is completely enclosed in a water-tight housing. The magnetic vibrations work it through the sealed plastic housing. It's priced at about \$10 by New Electric Razor Corp., Baltimore,

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Model 130 only \$23.86 for 2" to 12" diameter saws. 2 grinding wheels \$8.00 extra-

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Copyling and mismally

Last minute news & notes ...

CHEAP CAR rumors are rife again, but don't take them seriously. No big company plans
even a stripped-down model,
because: (1) glamour jobs sell
better, (2) production has to be
hitched to sales, (3) prices can
be cut only peamuts-worth of
raw steel, glass, rubber costs.
As one motor mogul told PS
scout. "A ring gear doesn't
care whether it goes into a
Chevvy or a Caddy."

KODAK'S NEW TOURIST Camera has a radically different shutter with a rotating rather than reciprocating action. Most between-lens shutters have top speed of 1/150 to 1/500; new Synchro-Rapid can snap at 1/800 second.

PLUMBERS would be smart to study up on atomics, say the PS editors who have been chinning with the muclear physicists.

More & more radioactive medical materials are going out to hospitals, and "hot" drains get clogged too. A Geiger counter may soon join the pipe-cutters and Stillsons in the tool box.

BENZEDRINE Inhalers, widely sniffed by hay-fever and head-cold sufferers, are being yank-ed off market by Smith, Kline & French Labs. Too many prison inmates and thrillkids opened them up to soak out active ingredient for quick lift. Makers tried adding red pepper, picric acid, other nauseating substan-

ces to stop misuse, but goofers who relished even paint and perfume were not bothered by bitters. So S.K.& F. developed completely new Benzedrex Inhalers, which shrink masal membranes but offer no stimulation to misusers.

MODERNIZED: Sailors on the crack Atlantic liner Isle de France, recently restored to service, scrub the decks with an electric floor machine!

POKITOOL is the name of a new socket wrench and screwdriver kit designed to fit the pants as well as the muts and screws - hex head, straight-slot, Phillips or Reed & Prince, Its 12 parts snap into 260 tool combinations. Made by Roberts Industries, Joliet, Ill.

MEW COLLEGE course in homemaking for men only is reported by McCall's Magazine. Studies include how machinery of living works--and how to fix it.P.S. readers need not apply.

QUOTE OF MONTH: Summer Pike, Atomic Energy Commissioner, commenting on progress, "We were...in the position of a crew who started out with a 1941 car from New York with orders to drive to San Francisco at better than 60 m.p.h. and in the meantime convert it to a 1949 model."

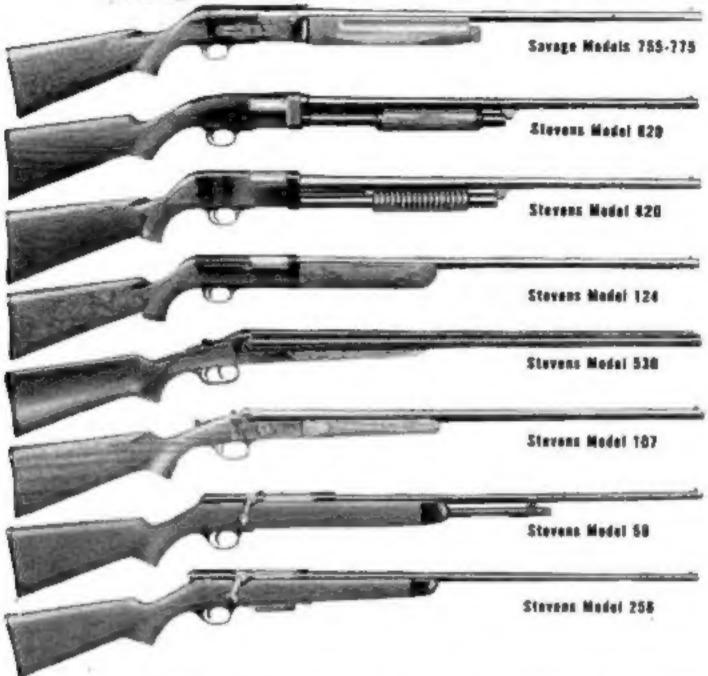
The Editors

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SHOTGUN VALUES



FIRST IN THE FIELD



Looks ... Performance ... Dependability at learnst cost make Savage-built shorguns the "first in the field" VALUES. Look over this wide range of models. Take your pick from sleekly streamlined auto-loaders (standard and lightweight models) ... fast-handling

"pump" guns... well balanced bolt action repeaters and dependable "singles" and "doubles". Then, choose the kind of gun for year kind of shooting at the price you want to pay. See these Values at your Dealer's—Write for Free Catalog.

Savage Arms Corporation . Firearms Division . Chicopes Falls, Mass.



Savage Streamlined Automotics — Models 755 (standard for long range shooting with heavy loads); 775 (lightweight for upland game and skeet). 12 and 16 ga. —3-5 shot. New, streamlined design. No changes in tested, service-proven functional design—changes affect exterior streamlining only—but trigger and hammer mechanisms have been improved.

Hevens Model 620 — Slide Action Repeating Shotgun. 12, 16, 20 gauge. 5-shot with one in magazine, making 6-shot repeater. Fast handling, smooth operating, dependable. Checkered walnut pistol grip; checkered slide handle.

Stevens Medel 820 — Slide Action Repeating Shotgun. 12 gauge only. The newest Savage "first in the field" value. Sensationally low priced. Natural pointing, smooth operating. Stock and slide handle of Tenite.

Stevens Model 124 — Repeating Shotgus. 12 gauge only. Features a compactly efficient, simple to operate cross boilt action — a Sevage pioneered design. A new value in the repeating shotgus field. Tenite stock and fore-end.

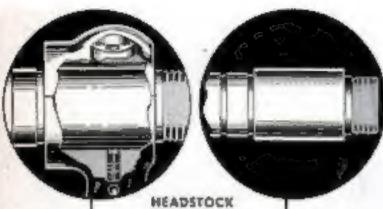
Stevens Model 530 — Double Barrel Shotgun. 12, 16, 20 and .410 gauges. Hammerless . . . coil springs . . . forged steel barrels. Checkered walnut stock and forearm, full pistol grip. Well balanced, natural pointing, dependable. (MODEL 311 DOUBLE — same as above but with stock and forearm of Tenite).

Stevens Medel 107 — Single Barrel Shotgus. 12, 16, 20 and .410 gauges. Hammer style . . . automatic ejector . . takedown . . . case hardened frame. Walnut stock and forearm. (MODEL 94 SINGLE — same as above but with stock and forearm of Tenite).

Stevens Model 39 — Bolt Action, Tubular Magazine, 6-shot Repeater. 410 gauge. 214 or 3 inch shells. One piece walnut finish stock with black tipped forearm. Lightweight, well balanced, attractively priced.

Stevens Model 258 - Bolt Action, Clip Magazine 3-shot Repeater — 20 gauge, 2 shells in clip, one in chamber. Walnut finish stock with black tipped forearm. Takedown. A fast handling, low priced model in a popular gauge.

SOUTH BEND 9" LATHES



Bearings are line bored and bearingized for precision lit. Ample jubrication from oil reservoirs. Spindle is carburized, hardened, and ground, with bearing surfaces super-linished to 000005 rms.

BELT RELEASE

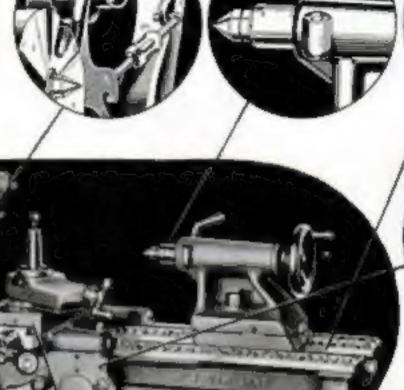
Instant release of belt tension for speed changes. Proper tension of headstock spindle drive belt is easily adjusted.

TAILSTOCK

Has set-over for laper turning. Graduated spindle has witness mark for aligning cutter bit. Hardened center self-ejecting.

360

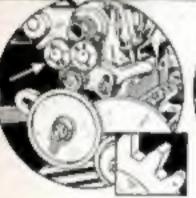
Three V-ways and one flat-way are handscraped entire length for precision alignment of headslock, lailstock, and carriage.





APRON

Has powerful friction clutch and large halfnuts. Safety interlock prevents engaging opposing feeds. All goars machine cut.



REVERSE GEARS

Easily shifted for reversing lead screw rolation and leeds, positive lock. All the gears used in this lathe are machine cut-



GEAR BOX

Screw threads and power leeds selected by shifting two tumblers as indicated on index chart All gears machine cut steel.



V-ways and dovetails hand scraped. Engine divided micrometer collars on feed screws. Compound Rest base graduated 180 degrees.

Specifications ...

South Bend 9" Model A Lathe

SOUTH BEND LATHE WORKS

456 fast Madison Street, South Sand 22, Indiana, U.S.A.

Please send catalog(s) checked:

- Catalog No. 9 all models of South Bend 9" Lethes.
- D Catalog No. 100 all sizes of South Bend Lathes.
- O Catalog No. 400 South Bend Precision Drill Presset.
- Catalog No. 500 7" Beach Shaper.
- O Catalog No. 77 Attachments and Accessories.

O Time Payment Plan.

STREET_____

282 POPULAR SCIENCE

9" x 3' Model A Bench Lathe, illustrated [Cat. No. 644-Y], with 12-speed harisantal drive, mator, and control — less bench . .

\$34045*

Time Payment Tares — \$85.45 down, 12 monthly payments of \$22.52.

Other models of South Bend 9" Lathes, priced from \$187.35" to \$805.45", may also be purchased on time payment terms of 25% down with balance in 12 monthly payments, small finance charge.

"Prices, E.o.b. factory, include 1 phase, 40 cy., 115-V. moter and control.



SOUTH BEND LATHE WORKS

BUILDING BETTER TOOLS SINCE 1904